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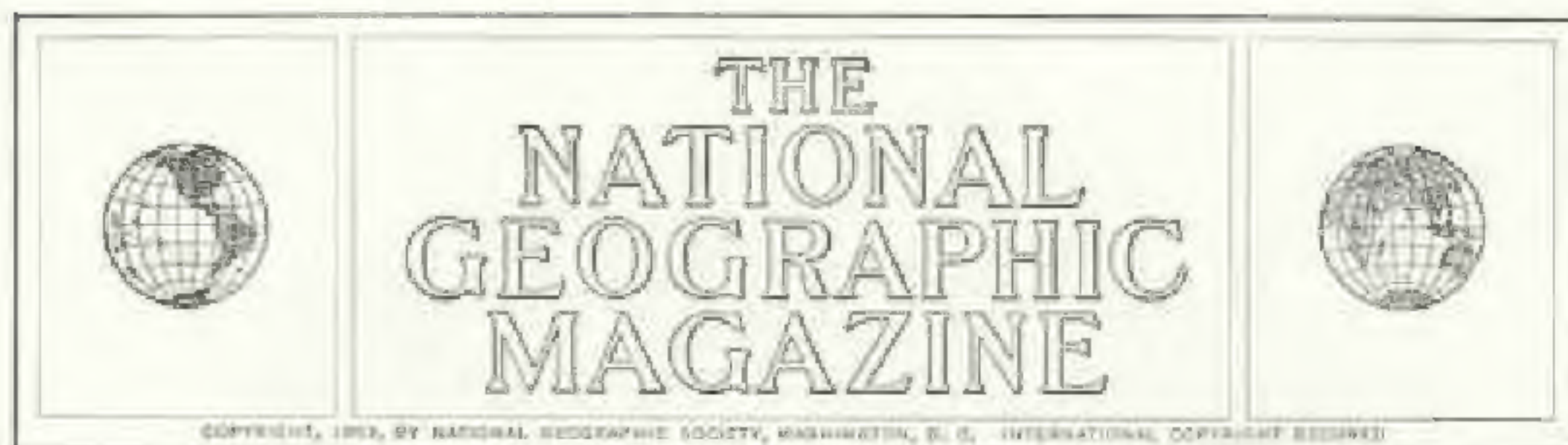
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the Troubled Face of East Asia

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Carlsbad Caverns in Color

433

Man-made Light, Outshining the Sun, Reveals a Fairyland
Made World-famous by the National Geographic Society

BY MASON SUTHERLAND

Assistant Editor, National Geographic Magazine

With Illustrations from Photographs by E. "Tex" Helm

CARLSBAD Caverns, which are usually as dark and quiet as the tomb, have stirred with nocturnal fire of late. For photography's sake, their limestone chandeliers and draperies have been bombarded with light four times as intense as sunshine. The caverns have seen New Mexico's most vivid flash since the firing of the world's first atomic bomb near Alamogordo in 1945.

Tex Helm, a Carlsbad photographer, has just finished shooting the caverns in natural color. His photographs inspired this article, the fourth on the caverns to be published in your Society's Magazine.*

"King of Its Kind"

The caverns were a relatively obscure national monument in 1924 and 1925 when the National Geographic Society put them "on the map." Backed by a \$16,000 grant from The Society, Dr. Willis T. Lee, of the United States Geological Survey (page 449), explored, surveyed, and mapped portions of the caverns and wrote two articles for the NATIONAL GEOGRAPHIC MAGAZINE.

"The most spectacular of underground wonders in America," Lee called them. "For spacious chambers, for variety and beauty, [the cave] is king of its kind."

Dr. Lee became the caverns' first custodian, serving without pay. In his day yearly visitors were counted by the hundreds. In 1952 attendance rose to a record 530,000.

Among the first men to see the caverns were the Basket Maker Indians, who left picto-

graphs on the entrance walls but apparently never explored the pit. Ranchers in the 1880's became aware of the cave because evening's spiraling bat flights darkened the sky above the mouth like the funnel of a tornado.

No one explored the deeper recesses until 1901, when James Larkin White, a young cowboy, descended with a kerosene torch and gazed upon hidden wonders.

Though Mr. White's story was greeted with incredulity, he made the caverns his life's work and hobby. Years went by before he saw his faith rewarded. In 1924 he guided the National Geographic exploration party, and in 1930 he saw Carlsbad Caverns established as a national park.

Besides Carlsbad Caverns, The Society has promoted public interest in Katmai National Monument, Alaska, site of the Valley of Ten Thousand Smokes; Sequoia National Park, California, where it helped save the Sierra redwoods; and Shenandoah National Park, in Virginia's Blue Ridge Mountains.

In Chaco Canyon, New Mexico, National Geographic-Smithsonian Institution scientists uncovered Pueblo Bonito, an Indian ruin. A later project dated it by tree-ring analysis. These investigations pushed back the Southwest's historic horizons almost eight centuries before Columbus.

* See "A Visit to Carlsbad Cavern, New Mexico," January, 1924, and "New Discoveries in Carlsbad Cavern," September, 1925, both by Willis T. Lee; and "Bats of the Carlsbad Cavern," by Vernon Bailey, September, 1925.



"Ladies and Gentlemen: You Are Entering the World's Most Spectacular Caverns"

Tour leader Claude Fernandez (right) tells hikers they face a sharp 829-foot descent, and "this is the time to take the elevator if you think you can't make it." Twilight may see 5 million bats streaming out of the entrance.

For my tour of the caverns I had the company of Col. Thomas Boles, superintendent of the park from 1927 to 1946. Colonel Boles, having retired from the National Park Service, lives in Carlsbad, where he serves the United States Potash Company as public-relations counsel. Carlsbad, a city of 26,000 lying 27 miles northeast of the caverns (map, page 450), is the capital of the United States potash industry. Its mines contribute 85 percent of the Nation's potash production.

Down, Down, Down—829 Feet

"During my 19 years at the caverns," Colonel Boles told me, "I spoke to some 2,188,000 visitors. They included Sir Harry Lauder, who wore his kilt; Robert Ripley, who broadcast from the cave; also Will Rogers, Dr. and Mrs. Gilbert Grosvenor, Burton Holmes, Amelia Earhart, and Ernie Pyle.

"Altogether," Boles continued, "I have made 5,071 complete trips and have enjoyed every one. With every tour I see something I missed before—a fossil in the wall or a natural carving brought out by new lighting."

For a moment we stood in the caverns' mouth, where ages ago a limestone collapse formed a natural entrance 4,350 feet above sea level in the foothills of the Guadalupe Mountains (opposite). Then we started walking down the switchbacks, a series of winding ramps descending 829 feet, the equivalent of an 80-story building. Before long we passed the entrance to the Bat Cave (page 442).

"I recall the time," said Boles, "when a party got caught in the bats' return flight. Women screamed and raised skirts above their heads.

"In those days we had no paved trails down the switchbacks but used staircases. The long, steep slope left unaccustomed leg muscles cramped and aching."

Entering the Main Corridor, a cathedral-like hall a mile long, we saw natural sculptures such as the American Eagle, with a 12-foot wingspread; the Whale's Mouth; the Three Little Monkeys, perched high above the trail; and the Baby Hippo.

My attention was drawn to millions of tons of material which had fallen from the ceiling.

"Don't be alarmed," said Boles. "You couldn't be in a safer place. No collapse has taken place in years."

We arrived at a collapse so spectacular that it has received a name—the Iceberg. Like a berg at sea, it conceals seven-eighths of its bulk. Despite its 100,000 tons, the Iceberg slipped so gently that its pendent stalactites received no injury.

Our trail led to the Green Lake Room, first of the scenic rooms, so named for their wealth of fantastic decoration. Here flood-

lights threw the Veiled Statue into bold relief (page 436), a frozen waterfall spilled out of a tunnel, and a small enchanted pond turned reflected light an emerald green.

Passing the Bashful Elephant, we entered the King's Palace, which some authorities consider the caverns' most ornate chamber (page 456).

There stalactites by the thousands glitter like icicles or chandeliers. One 7-foot pendant as slender as a soda straw is known as the King's Bellicord. Another downward groping stalactite and upward reaching stalagmite come within a knife's blade of kissing. Doomed never to touch, they are called the Frustrated Lovers.

These two stand guard over a keyhole entrance to the Queen's Chamber (page 459). There we found examples of the famous draperies, masses of stalactites grown together in the form of curtains (page 468). We saw no sign of the Queen herself, but the King's Boots hung in her chamber.

Baby of the royal chambers is the Papoose Room, its low ceiling gleaming with porcupine-quill stalactites. No one has described them better than the little girl who said, "That's just how my foot feels when it goes to sleep."

Old-timers Drank Drip Water

At times Boles used to halt touring parties in the scenic rooms for lunch, and they drank pure, cold drip water caught on the spot. In those days a certain guide was wont to announce: "All the garbage you don't eat put in this here can."

The colonel recalled that male guests used to carry lunches on their belts, and these wagged like tails. Sometimes when a man slipped and fell, he got up wearing an "apricot-ple sunflower."

Talk about food reminded us that we were hungry. Walking up Appetite Hill, 60 feet of rugged switchbacks, and past the Boneyard, a partly dissolved rock chamber (page 467), we came to the lunchroom (page 460).

Buying coffee and sandwiches, we visited the guides' table. There we met Dave Mitchell, an old-time guano freighter and dean of park employees.

Sight of Mr. Mitchell reminded Colonel Boles of the Rat Hole trip that parties used to take before tours grew too unwieldy.

"That narrow tunnel made an interesting detour from the main passageway," he said. "Everybody got a laugh when fat men got stuck in a tight gap. Dave had the answer—an old starched collar, saved for the occasion. Just as the visitor's trousers grew taut under strain, Dave ripped the collar apart with the explosive sound of rent garments."

"Well," said Mr. Mitchell, "I hate to tell





**Veiled Statue (Left)
Stands in the Green
Lake Room Like an Art
Work in White Shroud**

This guided party walked about a mile through the Main Corridor without seeing many spectacular formations. Having been promised much, some were beginning to wonder. But skepticism turned to awe when they entered the Green Lake Room, first of the scenic rooms, or decorated chambers. Now eyes were dazzled by thousands of delicate stalactites hanging iciclelike from the ceiling.

In contrast to the caverns' original explorers, who clambered over loose rocks and collapsed formations, these visitors follow a paved trail. Over their heads hang examples of the draperies, the curtainlike formations created by water depositing its mineral burden as it evaporated.

Each of the stalactites, the downward hanging stone lances, was formed by water seeping out of the ceiling and leaving a trail of mineral in tubular form, like a soda straw. Where the drip continued, droplets falling to the floor built a stalagmite growing upward.

Sometimes stalactite and stalagmite met and grew together in a pillar or column. Such a formation is the Veiled Statue, to which the National Park Service's uniformed tour leader points. Dripstone created this marvel within the last 100,000 years.

Age of the Carlsbad formations has been determined by the fact that many stand on flowstone laid above silts and fossils whose geologic age is comparatively recent. The caverns themselves are millions of years older.

The Green Lake Room takes its name from a small green pond (lower center) fed by drip water. Most of its formations have stopped growing, reflecting climatic changes overhead in semi-arid New Mexico.

© National Geographic Society

Illustrations by E. "Tex" Bates

this story—it sounds too fishy for belief—but once when I was resting on a bench in the caverns I saw an eerie light bobbing toward me as if someone were swinging a lantern. It went out just as mysteriously as it appeared. There was no one else in the passage, and in those days we had no electric lights. To the best of my knowledge, the thing was a fireball, a will-o'-the-wisp. I have met it several times since."

Occurring in marshes, will-o'-the-wisp, or ignis fatuus, is supposedly caused by the combustion of methane, or marsh gas. But no one in our party could account for the gas's presence in the caverns, for the air changes naturally every 24 hours. Some, however, recalled having seen cave fog where warm air met cold. Except where cold drafts seep in, the caverns' temperature remains a constant 56° F., winter and summer.

Rescued from Elevator Shaft

Talk got around to the two elevators, which stand near the lunchroom, and to the adventure of Les Thompson, a park ranger.

"One day in 1939," Boles said, "Les backed into an elevator shaft, assuming the elevator was standing where he had left it a few seconds earlier. Instead, someone had driven it to the 'basement' 754 feet below. Tumbling into darkness in a sitting position, he groped for the greased hoisting cables, caught them in the crook of his arm, wrapped his legs around them, and slid to a stop 150 feet down.

"Les then swung onto a girder, where an elevator crew rescued him. White and shaky, he emerged a few minutes later, much to the surprise of 11 people who had seen him drop. Then he went home and notified his wife. He returned to work two days later despite severely blistered hands. Since his escape Les regards himself as living on borrowed time."

Mrs. Jim White, who sells her late husband's memoirs at a booth close to the elevators, told me how she had cooked for Dr. Lee and other members of the National Geographic exploratory party in 1924.

"When Jim took them out to the Bat Cave and let them down in the iron bucket," she said, "I put a pot of beans on the stove, never knowing when they'd come back. Every day I drove burros with drinking water to the entrance."

Jim's old bucket, in which he let Bat Cave visitors down into 170 feet of darkness, hangs today in a prominent position above his widow's sales booth.

"Jim was my chief ranger, my showpiece," Colonel Boles remarked. "I used to introduce him to the crowd, then let him lead the tour. Long before I came here Jim sensed

that millions would follow him, and he did his best to preserve the beauties of the caverns. He'd fight a man who broke a formation. I made some exploratory trips with him. He was catfooted in his cowboy boots, and he was compass minded."

"My oldest visitor," the colonel reminisced, "was Thomas Burns, of Texas, who claimed 100 years. He walked down and then wanted to walk out, but I persuaded him to take the elevator. My youngest, Nelda Marie Davis, a 15-day-old Texan, was carried in on a pillow.

"A year-old baby making the tour still lacked a name, and her parents proposed that I choose one. I suggested Caverna. Nineteen years later a young lady came up to me and said, 'You don't know who I am, but you named me. I'm Caverna Clinch.'

"We used to keep a wheelchair for invalids," Boles said, "but my successors banished it when it ran away down a ramp, fortunately without injury to its occupant. One disabled man toured the caverns in a wheelbarrow, and kindly members of the crowd helped his relatives push it."

Our rest time was up. We hiked to the Big Room, whose mile and a quarter of trail consumes the second half of the tour. This richly ornamented chamber, the largest known anywhere, is shaped like a cross, one arm measuring some 2,000 feet and the cross-piece stretching 1,100. The ceiling at its highest rises 285 feet (page 464).

Passing the Painted Grotto, we caught a distant view of the Rock of Ages, a monumental stalagmite (page 462).

Texans at the Rock of Ages

At this rock Colonel Boles used to stop tour parties and call the roll of States, the members responding like delegates at a political convention. He saved the Texans until the last, because "choering the mention of their State, they made further roll call impossible."

We marched past Crystal Spring Dome, fastest growing formation within the caverns (page 454); the Bottomless Pit, whose bottom actually can be seen by flashlight (page 458); Mirror Lake, which correctly reflects its own inverted signpost; the Totem Pole, tallest of several skinny stalagmites resembling their Indian-made namesakes (opposite page); Temple of the Sun (page 444); Fairyland, where stone dolls pour stone tea; and finally the Hall of the Giants, where the Onyx Draperies and three huge domes stage the Big Room's smashing climax (page 466).

These big formations got the floodlights and signposts, but I took equal pleasure in some of the lesser sculptures, most of which had to be picked out with a flashlight. Among them I recall: The stone hen sitting on her



Totem Pole, a Thin Stalagmite, Soars 35 Feet Toward the Frostwork Ceiling

A parental stalactite of equal size is lacking because water dripped too fast to deposit a big evaporative growth overhead. From several angles the Totem Pole shows a tilt from the vertical.



Tex Helm Mounts His Camera Ladders to Shoot the Cave

For his color pictures of Carlsbad Caverns, Mr. Helm never set up fewer than a dozen cameras, each with a different lens opening to vary the exposure. He opened and closed shutters in total darkness, allowing flashbulbs to make a 1/30-second time exposure (page 448).

"As the caverns' floodlighting is dim," Mr. Helm points out, "visitors are only throwing their money away trying to make movies and color stills. The only effective method is flash."

★ Mr. Helm stands behind 2,400 spent bulbs used to illuminate the Big Room (page 464). These and others were provided by Sylvania Electric Products as an experiment in lighting vast sunless areas. Each bulb produced as much light as 1,200 sixty-watt house lamps.



Bats by the Millions Take Four Hours to Clear the Caverns' Mouth

Pioneer ranchers' attention was directed to the cave by evening's bat flights, which darkened the sky like the funnel of a tornado. By night the bats fly for insects; by day they sleep in a dark chamber (page 443).

nest for thousands of years without laying an egg; Statue of Liberty, a stalagmite, her left hand holding a torch; Abraham Lincoln, with furrowed brow and bearded chin; a life-size Santa Claus, complete to stocking cap, atop a totem pole; the Breast of Venus, a conical stalagmite; and the Mae West Formation, which has been blacked out by a change of lighting.

Also the Sword of Damocles, a bladelike stalactite poised above the trail; an enchanted city with Gothic skyscrapers, cathedrals, and castles standing in miniature atop a stone bluff; long stone faces having the quality of Easter Island sculptures; the stalactite growing from an elevator girder.

And finally the stalagmites that looked like fire hydrants; others that resembled giant candlesticks with melted wax running down their sides; stalagmites that looked like tombstones in a Moslem cemetery; still others coated with cancerous-looking "popcorn."

These and other wonders inspire a million questions, all of which the tour leaders answer

as best they can. A few adventurous visitors disappear into side passages, but when the guides switch off the rear lights the "explorers" quickly get back into line. Despite a strict rule against souvenir hunting, one man stole the lock and chain off an iron-barred chamber.

"Remember you can destroy in an instant what Nature took centuries to build," tour leaders point out. "Please don't touch the formations," they counsel. "Stay on the trail at all times and make your trip quietly."

Visitors Lose Sense of Time

I heard the silence rule broken at the Iceberg. Snapping off the lights to give us a taste of the utter blackness in which the caverns grew, a guide asked us to refrain from speech lest we destroy the illusion. A creepy interval followed. Then some man pinched his wife, she giggled hysterically, and the crowd roared.

In the caverns' dim lighting one loses all sense of time. Once when passing a park ranger I said, "Good night." His answering

laugh directed attention to my watch: it was 2:30 in the afternoon.

No place in the caverns is gloomier than the Bat Cave, an unlighted, off-the-trail passage seldom shown to visitors. The eerie feeling is heightened by an ominous dark giant moving across the walls—your own shadow cast by lantern light.

Millions of Bats Sleep in Cave

Guided by Richard Brasil the park's assistant naturalist, I visited the bats' chamber in mid-March, two months ahead of their return from a winter sojourn in Mexico.

We walked across beds of ancient and fresh guano and here and there stumbled upon dusty cables and rusting ore cars abandoned by guano miners. Those old-timers in 20 years removed 100,000 tons of fertilizer once stacked almost to the ceiling.

"In a good season, when insects are plentiful," said Mr. Brasil, "five to eight million bats sleep on the ceiling by day, hanging head down. We can count them because 250 to 300 are known to occupy a square foot, and it is a relatively simple flashlight job to measure their roosting area."

With that word, Brasil directed a beam at a small dark patch 100 feet overhead and calculated that the cave had approximately 2,000 tenants.

"Those 2,000," he said, "are the forerunners of the big migration to come this May. By evening they will stream out of the entrance like a cloud of smoke, and as many as 1,200 people may gather to watch them."

"Leaving at the rate of 300 a second, the bats take four hours to clear the exit (page 441). Water is their first objective. Like locomotives, they scoop it up on the move."

"I have stood among the bats flying out of the cave. Now and then a partial albino with white body and dark wings shone like a snowball in a coal pile. The colony's odor was sweet and musky and overpowering; one could almost judge the intensity of the flight by the smell."

Brasil was in no danger of being hit. Among the surest flyers in the world, bats move accurately in blinding darkness by using echolocation, a sort of natural sonar with which they send out squeaks, catching the echoes as they bounce off obstacles. The human ear can detect the beat of their leathery wings, and also their squeals of pain or rage, but not the guiding squeaks.*

Naturalists have counted 14 species of bats within the park. Of these, only seven roost in the cave. The overwhelming majority are Mexican free-tailed bats, so called because the tail extends about an inch beyond the inter-leg membrane.

Last year the naturalists banded 3,000 bats to determine where they went during winter migration. Five have been returned, the closest from the cave's mouth, the most distant from Jalisco, Mexico, 800 miles to the south.

"When the bats are here in full force," Brasil said, "few men care to stand below the ceiling, for fleas and bat flies ruin down. One authorized visitor, a parasitologist, was searching for those very pests. To collect them, he stood beneath the colony and exposed a bald, shiny head, then wiped it clean with a handkerchief. 'Thirty fine specimens' he cried, beaming. Stuffing dead bats in one coat pocket and guano samples in another, he departed happily on the bus."

"A former member of the park staff made rattlesnake collecting his hobby. He devoted every spare minute to his snakes. I truly believe he was fond of them. One day he was leading visitors through our cactus garden when an ugly rattler barred the path. Women screamed; men grabbed sticks and stones. Our friend grasped a stick, took aim, instead of slushing the snake, he defied the crowd. 'Don't you dare hurt that snake,' he warned. Then, using his stick, he removed the reptile from harm's way."

The cave itself, which never harbors snakes, does contain two species of mice. Once in a while the guides sight a mouse-like *caecumiste* or *rinetail*, that has wandered in.

One permanent resident is the so-called cave cricket, in reality a long-horned grasshopper, which feeds on the tiny organisms living on guano.

Other tenants are a cave worm, which has been identified as an insect's larva, and a tiny spider. Both spin webs in crevices and shelter along them.

An estimated 1,000 mule deer make the surrounding 49,000-acre park their sanctuary. Many a man has spotted them apparently reading a sign, "U.S. park boundary. No hunting allowed." By night my car's headlights picked up glow from the eyes of deer idling in the park highway. They showed no hurry to give right of way.

Cave Ice in the New Mexico Room

Guided by tour leader John Good, a geologist, I visited the New Mexico Room, an unlighted section of the caverns closed to the public because its unmarked paths are too steep, slippery, and dangerous.

"Not even experienced guides are allowed to come here alone," Mr. Good told me. "They must enter at least in pairs, so that if one slips and breaks a leg the other may

* See "Mystery Mammals of the Twilight," by Donald A. Griffin, NATIONAL GEOGRAPHIC MAGAZINE, July, 1940.



A detailed illustration of a large, gnarled tree trunk with a prominent, textured, light-colored bark. The bark shows deep vertical fissures and horizontal ridges. A small, bright yellow patch is visible on the lower left side of the trunk. The background is dark and blurred, suggesting a forest setting.

A close-up photograph of a tree trunk. A large, vertical, light-colored lesion or wound is visible on the bark. The lesion has a distinct, wavy, horizontal pattern, possibly indicating a specific type of decay or fungal growth. The surrounding bark is dark and textured.

A detailed illustration of a large, gnarled tree trunk with a prominent, textured, light-colored bark. The trunk is surrounded by smaller, similarly textured branches and foliage, creating a dense, naturalistic scene. The style is highly detailed, with visible wood grain and bark texture. The colors are primarily earthy, with shades of brown, tan, and green. The lighting is soft, highlighting the textures of the bark and the surrounding foliage. The overall composition is a close-up, focusing on the intricate details of the tree's structure.

A close-up photograph of a tree trunk. The main part of the trunk is covered in dark, rough, vertically fissured bark. A prominent, vertically oriented, light-colored (tan or cream) growth is visible, featuring a distinct, wavy, horizontal banding pattern. This growth appears to be a lichen or a specific type of bark. The background is dark and out of focus.

A detailed illustration of a large, gnarled tree trunk with a prominent, textured, light-colored bark. The bark shows deep vertical fissures and horizontal ridges. A small, bright yellow patch is visible on the lower left side of the trunk. The background is dark and blurred, suggesting a forest setting.

A close-up photograph of a tree trunk. The bark is dark brown and deeply textured with vertical ridges and grooves. A large, vertical, light-colored growth, possibly a lichen or a fungal infection, is prominent on the left side of the trunk. This growth has a distinct, layered, and somewhat fibrous appearance. The background is dark and out of focus, suggesting a forest setting.

A detailed illustration of a large, gnarled tree trunk with a prominent, textured, light-colored bark. The trunk is surrounded by smaller, similarly textured branches and foliage, creating a dense, naturalistic scene.

summon help." Not relishing the thought of being carried out on a stretcher, I took care as I picked my way up dripping ladders and flowstone.

Good called my attention to the Chocolate Drop, a large mound of dark-brown stone topped with gobs of marshmallow white.

Next, flashlights revealed cave ice, a crust of mineral formed on evaporating water like the curd on boiling milk. When the water drains away, the solidified crust remains like a sheet of ice.

Lily Pads Grow in Cave Pool

We saw stone lily pads forming in a shallow pool. Each drop of water from the ceiling created a ripple, causing the saturated water to deposit part of its mineral content as a "lily pad" at the surface of the pool.

Baby stalactites one-eighth inch in diameter hung from a rock-candy shrine. Good picked up a fallen specimen and pointed out its coral center, around which the mineral had been deposited. Like a boy at a soda fountain, I blew through the stone straw.

Good and I stood on a limestone balcony and looked down into the green waters of the Emerald Pool. Descending to its rim, we admired stalactites mirrored as stalagmites.

Hot and weary, I was tempted to take off my shoes and wade into the pool, but Good dissuaded me. "See these stony needles on the bottom?" he said. "They'd cut your bare feet to ribbons." So for relief we took a drink of the Emerald's cold, pure water.

Helictites grew in crazy confusion. Masses resembled frozen tumbleweeds, slender pieces looked like worms poking their heads out of apples.

Crystal helictites, unlike normal stalactites, take shape in all directions in seeming defiance of the laws of gravity. One explanation says that the power of crystallization surpasses the tug of gravity, allowing them to build upward and sidewise. Some tour leaders put it this way: "Helictites are female stalactites that can't make up their minds which way to go."

In 1924 Dr. Lee and his aides spent much time exploring and mapping Lower Cave which actually is no deeper than the scenic rooms. It gets its name from the fact that it may be seen 90 to 100 feet below the main trail. Two chyzes look down into it. One is the Jumping-off Place, a walled-in bridge from which no one has jumped yet. The other is the site of two rusting ladders used by the 1924 National Geographic expedition (pages 449 and 455).

Today's guides know five other ways of entering the Lower Cave. Instead of going down a series of wooden ladders, they pointed out

two phenomena. One was the Bookery, where pebbles, or cave pearls, grow in milky stone nests (page 449). Dripping water tumbles little grains of sand around in these traps, and as the grains roll they acquire concentric accretions not unlike those of oyster pearls. Sometimes they become so large they crowd one another out of the nest.

Close by I watched the formation of splashstone. Lime-laden drip water, splashing into a pool and spreading out in all directions, precipitated a powdery mineral wherever it struck and dried out.

Dripstone, which forms vertical stalactites, stalagmites, and draperies, is deposited in the manner indicated by its name. Flowstone, which paves floors and guano beds, is laid down in horizontal sheets. Frequently drip builds a stalagmite on top of flowstone.

The caverns were hollowed out of a 1,600-foot-thick formation of limestone called the Capitan. Limestone-precipitating algae laid down the stratum some 180 to 200 million years ago in the Permian Sea then covering this part of North America.

At the time the Rickies started growing about 60 million years ago, the Carlsbad Caverns area was uplifted. Between that era and the Pleistocene, a million years ago, ground water entered fissures and dissolved the less resistant stone. Collapse hastened water's work. Finally the water table fell and air filled the cavities.

At that time the second, or decorative, phase of cavern building set in. Rain water, seeping from the surface, picked up limestone. Wherever drip was slow enough to let it evaporate, the water deposited minerals which, drop by drop, formed stalactites and stalagmites. Nature tried to fill the chambers she took so long to hollow out.

Few of these secondary formations can exceed 100,000 years, for many rest on silk and fossils believed to be of that age.

Today 95 percent of the caverns is dry and dormant. Only a climatic revolution in semiarid New Mexico could bring fresh life to them.

How Helm Caught the Cave's Colors

For years the caverns defied accurate color photography. The National Park Service's floodlights, artful as they were, did not begin to satisfy the camera's needs. Tex Helm solved the problem with his multiple-flash gear, which fires banks of flashbulbs simultaneously (page 440). His 2,400-bulb shot of the Big Room set a record for flash photography (page 464). These bulbs produced light equal to that of three million 60-watt reading lamps.

Ernis Creed Helm, a native Texan, started



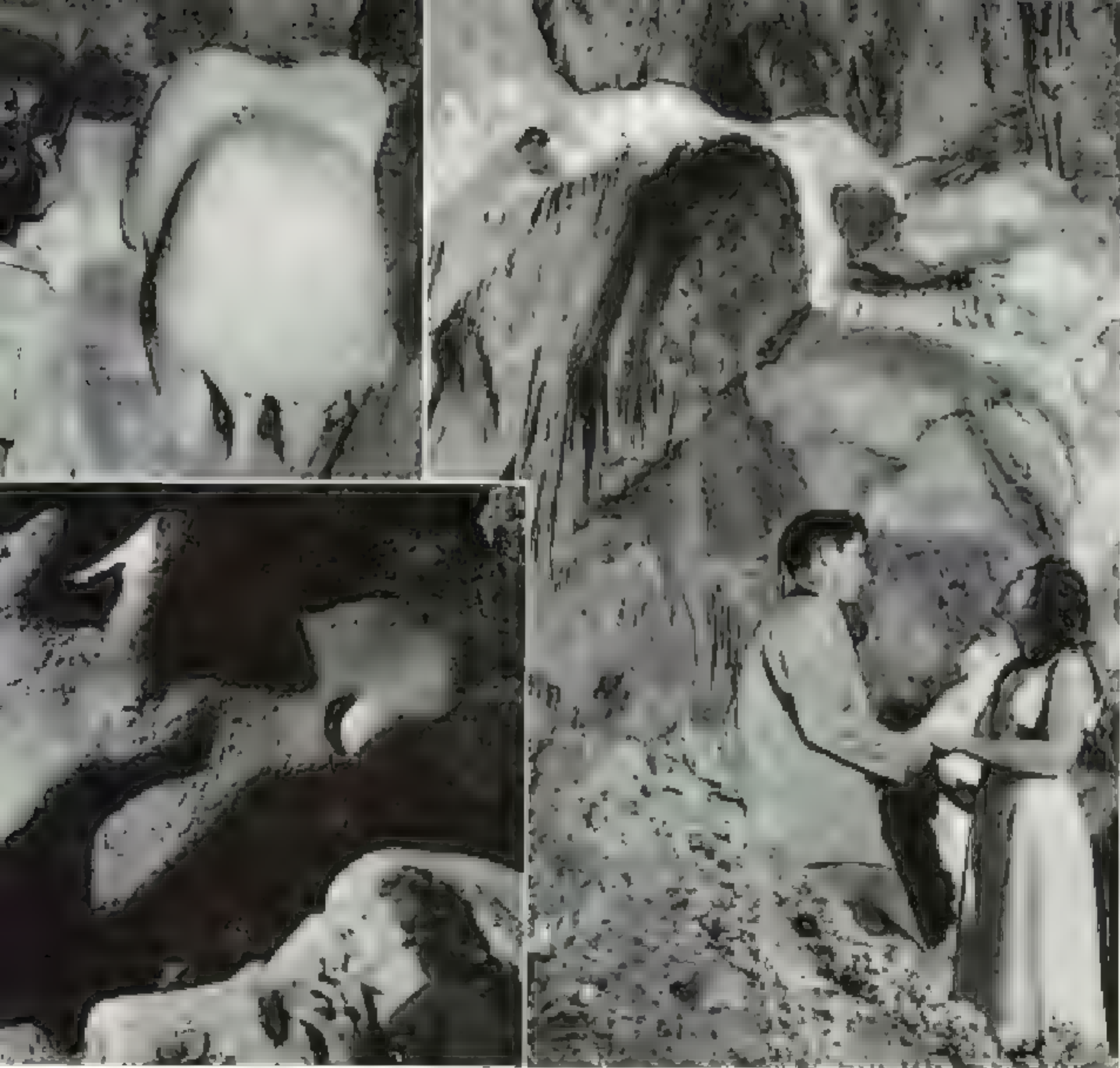
Park Men Explore the Durre Room

During the past few years, the Durre Room has been a place of great interest to the public. It is a place where the public can see the work of the Durre family, and where they can learn about the life of the Durre family. The Durre family has been a part of the life of the Durre family for many years, and their work has been a part of the life of the Durre family for many years. The Durre family has been a part of the life of the Durre family for many years, and their work has been a part of the life of the Durre family for many years.

At the Durre Room, the public can see the work of the Durre family, and where they can learn about the life of the Durre family. The Durre family has been a part of the life of the Durre family for many years, and their work has been a part of the life of the Durre family for many years.

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His professional career in 1923 was a three-year report on the first American steam railway, and following a period working for three months in Mexico and another six in the United States, he was employed by the U.S. Department of Commerce.

After the war, the U.S. military continued to use the same security procedures, but with a different twist. The military's security procedures were not as strict as those of the CIA, but they were not as lax as those of the State Department. The military's security procedures were designed to protect the military's secrets, but they were not designed to protect the military's personnel. The military's security procedures were designed to protect the military's secrets, but they were not designed to protect the military's personnel. The military's security procedures were designed to protect the military's secrets, but they were not designed to protect the military's personnel.

One day, Hilly had an idea. He took the film he photographed several days before, from before at night, and took it outside. He asked someone to help him in order to see what the film would display. So they set up the

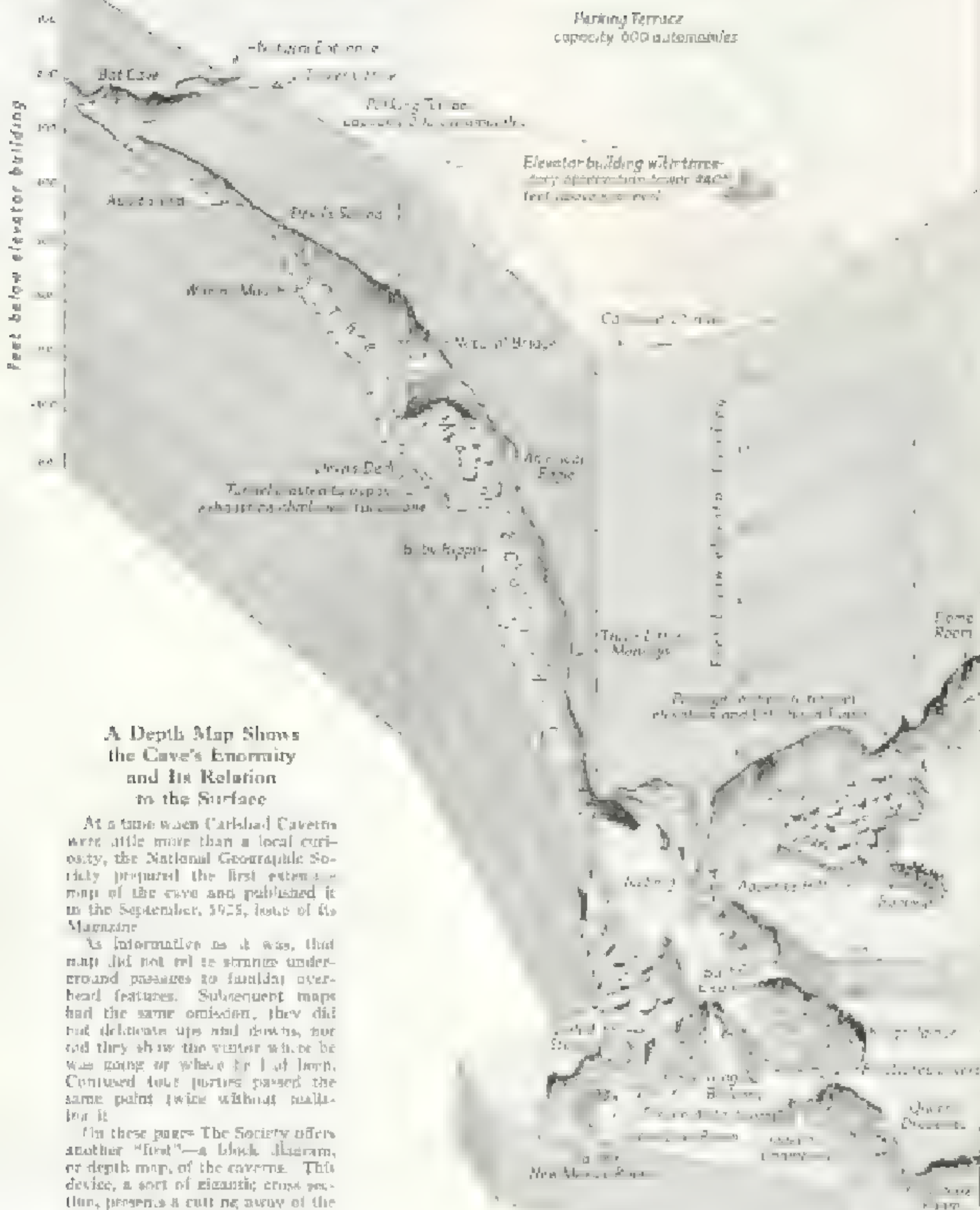
Estimated by least squares method. The response function for a given location, λ , is given by the first term. The second and third terms are a function of the time lag, τ , and the time lag squared, τ^2 , respectively. The fourth term is a function of the time lag, τ , and the time lag squared, τ^2 .

Other persons in the room were never excluded for the National Laboratory.

Moreover, which proved to be a cheap and fast method. Kinoshita, Saitoh, and Sugita¹ served a paper containing the outlines of the above-mentioned scheme, proposed in the 1960s, to the public.

He has been away at night schools and has spent the last 10-15 years in the States. There are no today. Four times a week we go to the exercises and dance at the school of exercises. He and his wife have been in the world, now, with the same sense of purpose and vigor. We have been out about 100 miles. I was married to the same lady as now. We have

Various other things in this same room were done. When I saw the doctors engaged in the room with their hands and beside them to make the table and hand it into the crutches. There were some other things which were treated, and about the other part. The other things were made in a way which was a surprise between the two students. The other part was



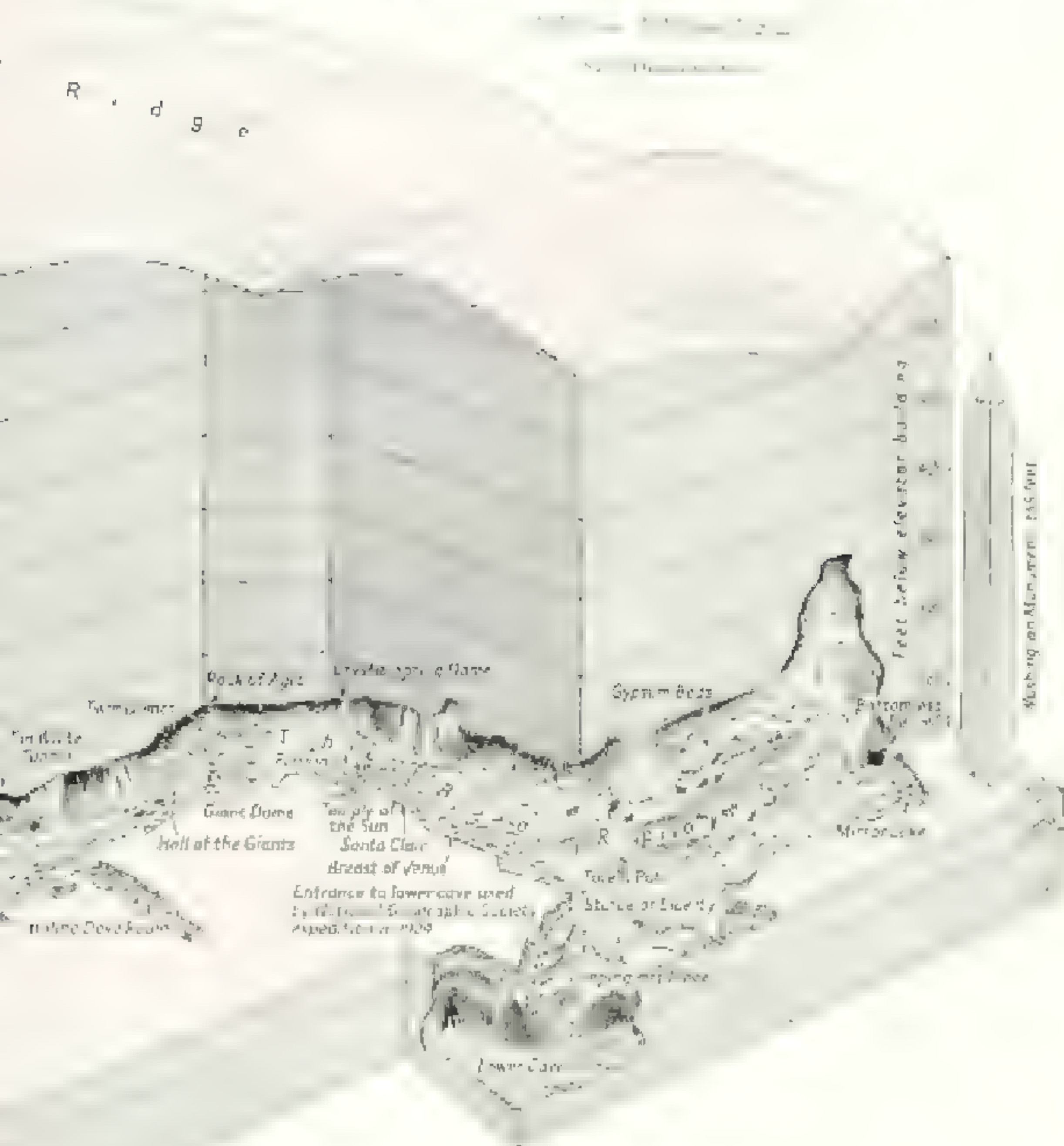
A Depth Map Shows the Cave's Enormity and Its Relation to the Surface

At a time when Carlsbad Caverns were little more than a local curiosity, the National Geographic Society prepared the first extensive map of the cave and published it in the September, 1925, issue of the Magazine.

As interesting as it was, that map did not set a standard underground passages to forbidden overhead features. Subsequent maps had the same omission, they did not delineate ups and downs, nor did they show the winter where he was going or where he had been. Continued toll parties passed the same point twice without realizing it.

In these pages The Society offers another "first"—a black diagram, or depth map, of the cavern. This device, a sort of zodiacic cross-section, presents a cutting away of the earth and an unroofing of the cave to show subterranean features, top to

[illegible]



bottom. With diagram in hand the visitor can on or himself easily and visualize the enormous rock masses hanging over his head.

The diagram shows the cavern's depth and the various features of the cavern. It shows three miles of paved trails but omits 70 miles of obscure, seldom visited passages. The 2,000-foot-long Bat Cave is indicated by its entrance (left).

It takes but a glance to see how the subterranean room toward surface features such as ticket office, three-story elevator building, and 600-car parking lot. The 535-foot Washington Monument, sketched in for comparison, gives an idea of the cavern's depth.

National Geographic cartographer Walter Morrison prepared the diagram. To get accurate data on elevations, he made his own measurements. Using range finder, hand level, and altimeter, he added depths of cavern floors and heights of ceilings to existing flat maps. At places where no reliable data was available, he used the best available information. To depict formations accurately, he used better than 100 photographs and projections from the top of the cavern.

set at a slightly different lens opening to compensate for error in calculating the amount of light.

As the park's floodlights were turned off, plunging the cave into darkness, Helm mounted a stepladder and opened the shutters. He had to memorize the position of every camera so as not to tip it out of line.

When Helm gave the command, "One, two, three, fire," hundreds of bulbs crackled. Light as startling as lightning, bathed the caverns in a blinding, crucible glow for one-thirtieth of a second. When darkness reigned again, Helm closed the shutters. But the job was not ended; every bit of debris had to be cleared from public sight.

"Nothing seems natural down here," Helm told me. "The caverns are another world. Distances are deceiving; so are the angles of light and bounce. Some stones absorb the flash; others reflect it. Just when we think we have things figured out, along comes a new problem like afterglow in some rocks to knock out all our calculations and burn up sections of pictures."

Cave "Orphans" Coo and Howl

On the surface, gurgles and yells from dozens of assorted infants introduced me to the Cavern Supply Company's day nursery, which takes care of children too young to accompany parents on the four-hour tour underground. Older children were attending to ice-cream party when I walked in; babies in cribs were sucking bottles.

"The young ones cause little trouble outside scores of diaper changes daily," said Mrs. Lila Haney, the matron in charge, "but a few of the four-year-olds try to tear the house down."

"Most of our children cry when parents leave them, but learning to have fun in one another's company, they weep again when mamma and papa take them away."

"Our youngest charge was just a week old. Our eldest, 92 years, was a grandmother too frail to explore the caverns. Later I got a letter from her. 'That day with the children was the happiest of my life,' she wrote."

Visitors' pets are guarded in kennels close by. They have included dogs, cats, monkeys, a deodorized skunk, and a lion cub.

"Once we kept a hen that had traveled 3,000 miles by car," Mrs. Haney said. "Tongue hanging out in the heat, she arrived wrapped in a wet towel. 'Be careful with her,' said her mistress. 'She is our only baby, and we had no one to leave her with at home.'"

One day tour leader John Patterson borrowed a pickup truck and drove me to New Cave, or Slaughter Cave, one of 30 known caverns within the park. New Cave cannot

match the size or beauty of Carlsbad Caverns, but several formations are more spectacular. Wild and exhausting trails to the cave keep it shut to public view.

It was the first day of spring, and a 40-mile wind kicked up clouds of dust from plowed lands in Black River Valley. Passing Rattlesnake Springs, where an artesian flow creates an oasis, Mr. Patterson drove into the foothills of the Guadalupe and parked beneath an abandoned guano hoist. Steel cables ran up a mountain to the mouth of the cave. As the rusting machinery could not give us a lift, we took off on foot. Loose rocks and 30-degree grades left us panting.

Unlocking the steel door, Patterson and I switched on our flashes and descended into the gloom. We stumbled across guano deposits a yard thick and—who knows?—perhaps a million years old. Miners had left cables moored to massive stalagmites.

At a branching of the tunnel we came upon a pillar more enormous than any in the main caverns. We estimated its height as 100 feet, and Patterson, thence stretching out six feet of arm, demonstrated that its diameter was more than 18 feet. Fluted draperies decorated the column from ceiling to floor. Tapped, they resounded like organ pipes.

A few paces beyond we examined the Chinese Wall, a series of wavy stone levees a few inches high. Wall within wall, they suggested the concentric fortifications of a medieval city.

As we explored farther, each footstep produced a hollow booming sound. Our drum-head was a thin layer of flowstone formed above clay long since washed away.

Another tunnel revealed the Christmas Tree, a stalagmite glittering with crystals.

Using New Cave's awe-inspiring settings, movie makers filmed some cavern sequences of *King Solomon's Mines*, a story of Africa.

Caverns Earn a Profit for U. S.

Returning to park headquarters, I had a final talk with the superintendent, R. Taylor Hoskins.

"Making money is not the main objective of a national park," he said, "but it doesn't hurt. In fiscal '53 we received an appropriation of \$258,000 and returned about \$475,000 to the U. S. Treasury."

"From 1946 to 1953 the park had almost three million paid visitors. I have overheard many of them say, 'It was the best \$1.20 I ever spent.'"

"If Carlsbad's popularity continues to increase, I visualize the time when we shall have to extend trips into the night. In the future we may open New Cave, making the park a 2-day tour."



Limestone Cascades in a Frozen Niagara Stone Parachutes Hang Motionless in Air
 These big stone "parachutes" have remained open 200 and 300 feet in the air for hours. The fact that
 some "parachutes" are made of stone and others of ice is due to the fact that the stone is heavier than the ice.





A Moist and Glorious Cave at Spring House in the Colorado

Some of the most beautiful
caves in the world are found
in the Colorado mountains.

At the Spring House, in the
Colorado mountains, there is a
cave which is one of the most
beautiful in the world. It is
called the "Cave of the
Spring House" and is one of the
most beautiful in the world.

It is one of the most beautiful
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The Cave at Spring House is a Wonderful Place

The cave at Spring House is
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It is one of the most beautiful
caves in the world. It is one of
the most beautiful in the world.



King's Palace Glitters with Stone Chandeliers Like the Ballroom of an Emperor

The results of the analysis of the data from the 1990s are presented in Table 1. The results show that the mean age of the respondents was 45.5 years, with a range of 18 to 75 years. The majority of the respondents were male (68.5%), and the majority were married (68.5%). The majority of the respondents were employed (68.5%), and the majority were in the public sector (68.5%). The majority of the respondents were in the middle management position (68.5%), and the majority were in the middle management position (68.5%).

The Butterflies of New Adair, Texas How the Trail

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The Queen's Chamber Shows the Wonders

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A Hungry Visitor Gets a 10-minute Rest in the Lunchroom

Under the work bench at the entrance to the Alameda Hotel, the street car, 2441, pauses for a 10-minute rest. The car is being repaired, and the workmen are taking a 10-minute rest. The car is being repaired, and the workmen are taking a 10-minute rest.

The Alameda Hotel is a large, modern building, and the workmen are taking a 10-minute rest. The car is being repaired, and the workmen are taking a 10-minute rest.

The Alameda Hotel is a large, modern building, and the workmen are taking a 10-minute rest. The car is being repaired, and the workmen are taking a 10-minute rest.

Continued on page 10







In the Big Room: The Trail Passer Rock of Ages

Occasionally a guide in the dark and distant shadows of the interior of the Rock of Ages is the man who has been chosen to be the speaker.

Because of the huge wall this speaker is not particularly supposed to be one of the noble orators. He is only there to read a list of determining the exact age, no one can tell when it grew or how fast.

The National Park Service uses for both an important ceremony at the rock. After an experiment had discovered an important address in a certain dipped a sweet young man he had one personal darkness. Then on the green park rangers advised singing "Rock of Ages" and the only words in section in section. It really grows grew so large that it became impossible to see anyone visitor and come in the ceremony. It was a great and the difficulty though all over the country was in section.

For the right another frozen water it shows droplets started like eternal clouds. For people to see the first person that is a man that they are a good man.

Children are not a large collection of many others are more used but none can watch the importance of the section. The National Park Service and the other colored children are on showing the sections to their natural state.

The new two pages display the history of the park and the distant passage.

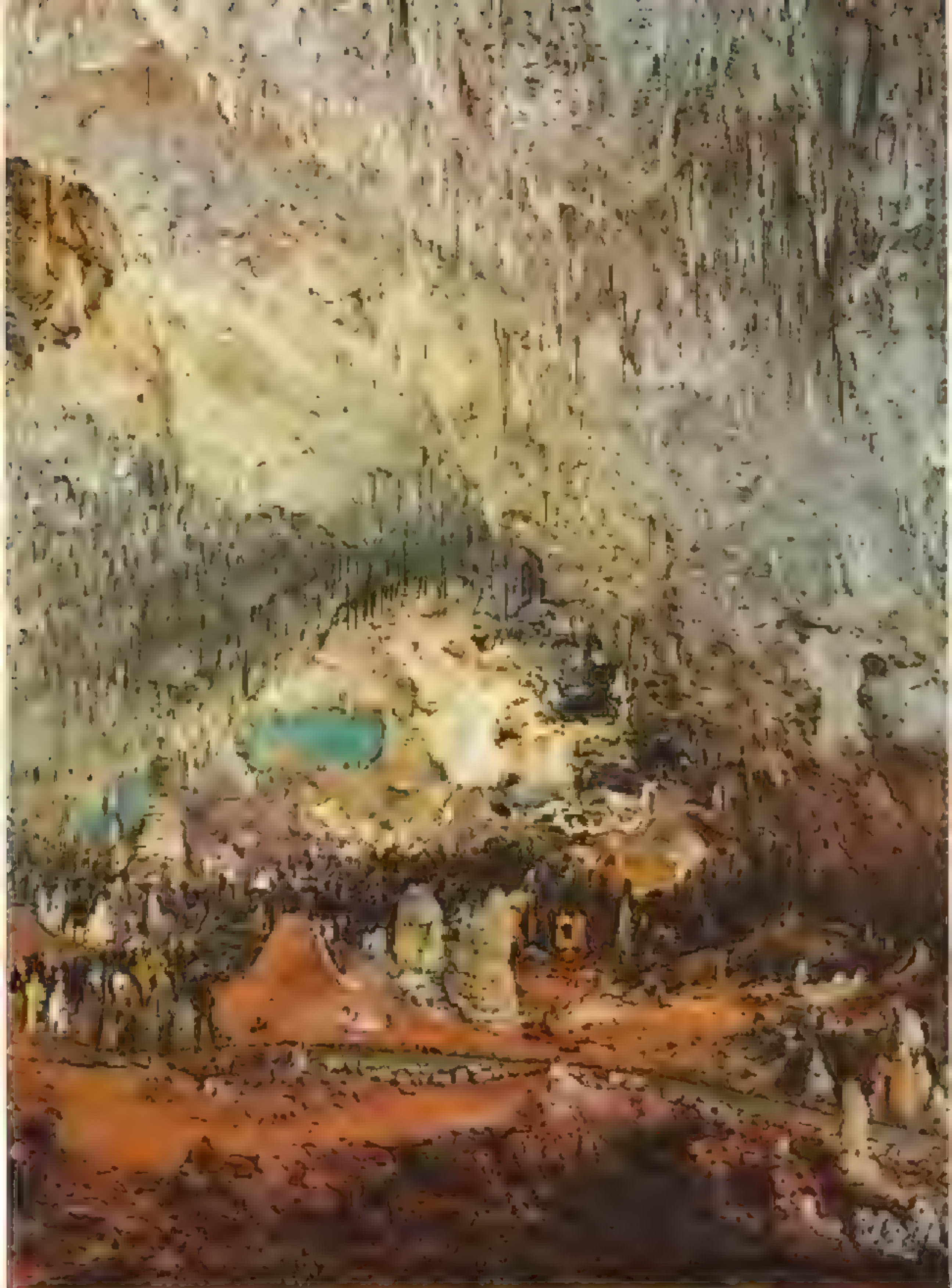
See the page 1000

See the page 1000



Photography's Biggest Flash Story: It Took 2,400 Bulbs to Light the Big Room

The photograph was taken by the photographer, who used a camera with a flash that could illuminate a room the size of a football field. The flash was made up of 2,400 small light bulbs, each of which was controlled by a separate switch. The flash was used to illuminate the room for a few seconds, and the photograph was taken during that time.



Distant Rock of Ages and Other Stalagmites Stand Out Like Icebergs in a Colored Sea

Stalagmites of the Blue Room, a cave in the heart of the Blue Room, are seen in a series of photographs. The cave is a natural formation, and the stalagmites are of various sizes and shapes. The cave is a natural formation, and the stalagmites are of various sizes and shapes.



A Three-Masted Barge Sketch (continued) in the Hall of Mirrors

Continued from page 100. The barge is a three-masted vessel, with a single mast at the bow and two masts at the stern. The hull is white, and the masts are black. The barge is shown in profile, sailing on a blue sea. The background is a light blue sky with a few white clouds. The barge is a small vessel, and the sketch is a simple line drawing.

The Barge, a Story of the Swiss Lake

Many of the Swiss lakes are small, and the barge is a small vessel. The barge is a three-masted vessel, with a single mast at the bow and two masts at the stern. The hull is white, and the masts are black. The barge is shown in profile, sailing on a blue sea. The background is a light blue sky with a few white clouds. The barge is a small vessel, and the sketch is a simple line drawing.



Queen's Draperies Glow in Forelight

Some of the most striking features of the new Queen's Draperies have been noted.

At once they form the perfect picture of a woman's face, and the color of the draperies is the most perfect of all. The color of the draperies is the most perfect of all. The color of the draperies is the most perfect of all.

It is a fact that the Queen's Draperies are the most perfect of all. The color of the draperies is the most perfect of all. The color of the draperies is the most perfect of all.

It is a fact that the Queen's Draperies are the most perfect of all. The color of the draperies is the most perfect of all. The color of the draperies is the most perfect of all.

Dolls' Theater Fascinates Children

The dolls' theater, which is a new feature of the new Queen's Draperies, has been noted. The dolls' theater is a new feature of the new Queen's Draperies. The dolls' theater is a new feature of the new Queen's Draperies.

The dolls' theater is a new feature of the new Queen's Draperies. The dolls' theater is a new feature of the new Queen's Draperies. The dolls' theater is a new feature of the new Queen's Draperies.

The dolls' theater is a new feature of the new Queen's Draperies. The dolls' theater is a new feature of the new Queen's Draperies. The dolls' theater is a new feature of the new Queen's Draperies.



BY GILBERT GROSSENOR AND THOMAS W. MCKNEW

President and Secretary of the National Geographic Society

AT ACROSS the Atlantic wide stretch of Arctic space the six men and their sledges crawled, dark specks on the white icy crown. The air they breathed was bitter, with an edge of frozen steel. They climbed each pressure ridge fearful of finding on the other side the open lead of inky-black water that would spell, at the least, a costly letour; at worst, defeat (page 484).

They were lucky. Only one great lead caused much delay; no blizzards pinned them down; with temperatures rising to 15° below, their dog teams reeled off marches of 25 to 40 miles a day over the slick sea ice. On April 6, 1909, after 37 days of continuous sledging from Cape Columbia, Comdr. Robert E. Peary, U. S. Navy, and his men reached their long-sought goal. For the first time in history men stood at the earth's apex, the North Pole.

Inevitably we thought often of this gallant band when, last May, we retraced by plane Commander Peary's route to immortality. We had been invited by the United States Air Force to accompany a routine staff visit to northern bases. The Air Force periodically performs such missions to acquaint high-ranking officers with problems of supply and operations. Many airmen have flown across the Pole since Lt. Comdr. Richard Evelyn Byrd and Floyd Bennett in their little monoplane blazed the first sky path in 1926.* But for us the journey had peculiar significance.

Society Long Interested in Pole

The National Geographic Society, since its founding in 1888, has followed actively the successive assaults against this grim objective. It has supported many expeditions, placed all its cartographic and technical resources at the service of Arctic explorers, and cooperated fully with the United States Government's polar research. Its staff has developed special apparatus (such as the Baunstead sun compass, forerunner of the astrocompass) for high-altitude navigation. Some ninety articles about life at the top of the world have been published in The Society's official journal, the NATIONAL GEOGRAPHIC MAGAZINE.†

Moreover, one of us [Grossenor] had enjoyed the inspiring friendship of all the great Arctic heroes, from Admiral George W. Melville, U. S. Navy, and General A. W. Greely, U. S. Army, to Nansen, Peary, Amundsen, Byrd, Ellsworth, Noble, Donald MacMillan, Rasmussen, Sir Hubert Wilkins, and James W. Cook, as well as Anne H. Rossell, explorer's mate and last survivor of Fisher Kent

Kane's Expedition of 1853-1855 (page 474).

On that May morning, as our huge four-engined C-54 flew poleward, we looked down upon the glassy park ice with profound respect and humility. We knew well the lives, the agony, the treasure, the bone-weary efforts which, for more than 300 years of exploration, had been poured into the campaign to reach latitude 90° N.

Much Planning Behind Flight

Yet here we were, cruising at 9,800 feet in a warm cabin, leaping in a matter of minutes huge expanses of ice which had cost Peary and his followers many a long day's painful trek (page 471). But it was not that simple, for behind our flight were many months of planning and the efforts of a fine crew carefully selected for experience in Arctic flight.

At 12.28 a.m. on May 18 we took off from Andrews Air Force Base near Washington, D. C. Our objectives were multiple: we wanted to see with our own eyes the bewitching white world about which explorers and artists have raved; to study the colorful rocks and cliffs rising above the snow; and to see the ice field at the Pole itself.

Our plane was outfitted with bunk, galley, refrigerator, and other amenities. Personnel were from Headquarters, USAF, and from the Air Force's far-flung Military Air Transport Service.‡

Just before take-off our flight steward, Sergeant Horschulder, briefed us on emergency ditching procedures and gave us a short parachute drill.

"If we get in trouble up north," he said, "we'll try to bring the plane down. But outs are risky, you're likely to get pretty widely separated, and we can't carry down a tenth as much equipment as we have on board."

* See "First Flight to the North Pole," by Lt. Comdr. Richard Evelyn Byrd, NATIONAL GEOGRAPHIC MAGAZINE, September, 1926.

† For other articles on the Arctic, see the two-volume NATIONAL GEOGRAPHIC MAGAZINE COMPANION, THE POLAR JOURNALS.

‡ Participants in the Top of the World Flight, in addition to the authors, were: Col. John T. Shields (HQ, USAF), commander of the flight; Col. Paul H. Tibbets (HQ, USAF); Col. M. A. Hober (USAF), Lt. Col. J. A. McMillan (USAF); Capt. William Campbell (USAF), flight commander; Capt. Donald E. Smith (HQ, USAF), copilot; Capt. E. W. Black (USAF), navigator; Capt. David A. Beach (USAF), Polar navigator on North Pole leg; T/Sgt. E. G. Tool, engineer; T/Sgt. E. E. Sathlun, engineer; S/Sgt. J. E. Cahill, radio operator; A/Tc Richard F. Fickel, radio operator on North Pole leg; S/Sgt. L. H. Horschulder, flight steward.



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A Lonely Shaft Overlooks Ruffin Bay; P Stands for Peary and the Pole

Financed by Admiral Peary's family, the 60-foot nylon was erected on Cape York, Greenland, by a 1937 expedition led by Capt. Robert A. Bartlett, one of Peary's aides on the 1909 ~~expedition~~ that reached the North Pole. The ~~air~~ ~~base~~ ~~was~~ ~~passed~~ ~~over~~ ~~the~~ ~~memorial~~ ~~en~~ ~~route~~ ~~from~~ ~~New~~ ~~foundland~~ ~~and~~ ~~to~~ ~~the~~ ~~United~~ ~~States~~ ~~Air~~ ~~Force~~ ~~Base~~ ~~at~~ ~~Thule~~, 60 miles to the north (map, page 4).

Besides, the plane makes a good rescue marker in itself. On the other hand, if the ice is too hummocky to risk crash landing, we'll just have to abandon ship. Then you'll each strap your individual survival kit to your chute and hit the sky.

We soon turned in and, with only a few minutes of turbulence as we flew through rain squalls over Long Island, New York, slept placidly till dawn.

Newfoundland Base First Stop

We breakfasted on coffee and buttered Nova Scotia.* Not till we soared over Cabot Strait did the undercast yield, disclosing the French islands of Mingotou and St. Pierre, last North American fragments of a once broad empire, and Placentia Bay, where President Franklin D. Roosevelt and Prime Minister Winston Churchill met to draft the Atlantic Charter aboard the ill-fated British battleship *Prince of Wales*.

In Newfoundland we touched down at the Royal Canadian Air Force Base of Torbay just north of St. John's, and motored to the USAF's Peppercorn Base headquarters, where our hosts had official business.

Soon Mr. R. B. Herder, president of the St. John's *Evening Telegram*, appeared with a car and a friendly invitation to visit Brigus, some

40 miles distant, home town of the late Capt. Robert A. Bartlett, Peary's second-in-command and Hubbard Gold Medalist of the National Geographic Society.

More interesting than Brigus's stone monument to the great skipper proved to be the surviving Bartletts. Within the house Bob built for his mother she had set aside a room especially to display mementos of his remarkable career. Here Bob's brother, B.J. (hardy as a pine knot) regaled the company with reminiscences of Captain Bob's salty adventures.

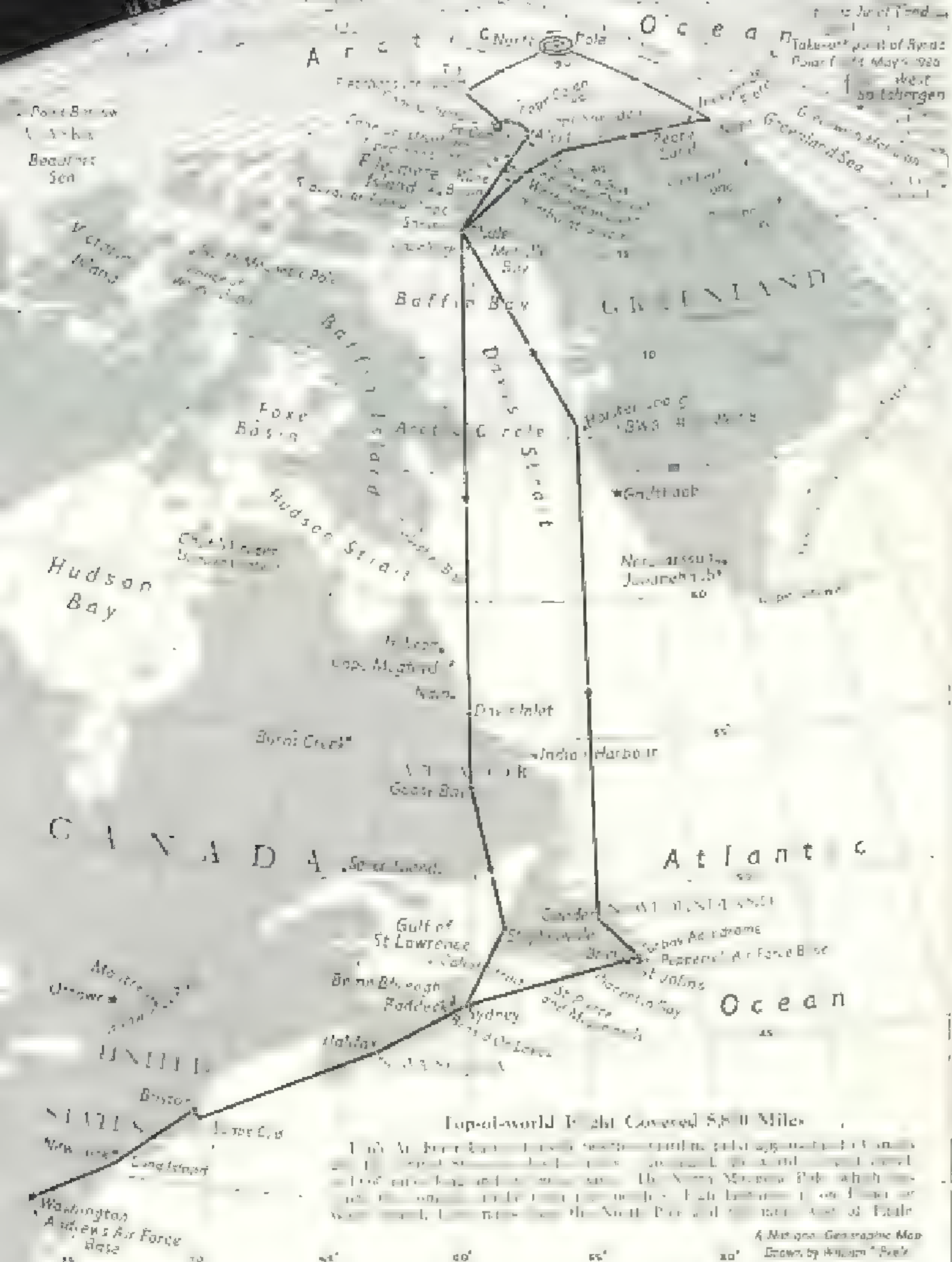
Back at the air base plans were made for an early take-off. At 6:30 a.m. we zoomed off the runway. Our goal: Thule, 2,041 miles away. A dog-leg took us over Gander; then we headed for a radio beacon on the Greenland coast—RWS, an Air Force installation near Hvalsborg, better known to World War II ferry pilots as Blatz West B.

Persistent undercast blanked out our gaze all the way to Thule, except for a few miles down Davis Strait. But on our maps we could check off landmarks of polar exploration as we flew invisibly at 9,500 to 10,000 feet.

* See "Salty Nova Scotia," by Andrew H. Brown, NATIONAL GEOGRAPHIC MAGAZINE, May, 1940.

† See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Seething Arctic Airwaves," May, 1940, and "Greenland from 1854 to Now," July, 1940, both by Capt. Robert A. Bartlett.

UNION OF SOVIET SOCIALIST REPUBLICS



Top-of-the-world Flight Covered 8,800 Miles

The flight from Washington, D.C. to the North Pole and back was the longest non-stop flight in the world. The flight was made by a C-124 transport plane, which was modified to carry fuel and supplies. The flight was made by a crew of four, including the pilot, co-pilot, and two flight engineers. The flight was made on May 13, 1955, and took 15 hours and 45 minutes to complete. The flight was a major achievement in aviation history.

A Map of the Arctic Region
Shown by William F. Smith

Under the North Atlantic Treaty a pact was signed by Denmark and the United States concerning the release of Greenland—a model of international cooperation.

To put muscle into that pact, the United States in the spring of 1951 sent a small army of skilled workmen north to Thule. Army engineers and transportation units, teamed with civilian tractor drivers, contractors, stevedores, carpenters, and architects, invaded North Star Harbor in what was called Operation Blue Jay, or "Normandy-on-ice." All manner of equipment came with them—a 29,000-pound power shovel, 100-ton earth compactors, bulldozers by the score, and a mammoth sea-water distillation unit.

Working around the clock in eight-hour shifts through the continuous daylight of two summers, these men laid out a 10,000-foot airstrip and a 480-acre town chuckablock with fuel tanks, hangars, barracks, offices, warehouses, radio installations, a huge gym.

Weather was the main enemy.

Temperatures sink so low in Thule that steel and rubber get brittle. Cold storage lockers have to be heated, and engines kept running continuously; water must be delivered by truck, not pipe.

All buildings except the hangars are constructed with a three-foot air space beneath them, both to let the snow blow through without piling up and to prevent the floor's warmth from melting the ground's top layer of permafrost. Light structures, mounted on stilts, must be anchored with concrete weights to keep them from blowing away.

Baseball in the Icebox League

Construction still goes on at Thule, but life is less strenuous than in the first frantic years. Ball teams such as the Frigid Fights, the Little Siberians, the Pie-eyed Pipers, and the laundry unit's Wet Sox compete in summer games which may be called on account of exhaustion but never on account of darkness. Bowling teams were in full action while we were there.

Other workmen off duty read the *Glacier Gazette*, cradle a basketball in the gym, try out for the glee club, or listen to Thule's radio station KQED.

A base reporter, waxing enthusiastic over the number of arctic flowers which employees had grown, asked editorially: "What's Hawaii got that Thule hasn't?" One answer might be: women. We saw only two on the whole post—the wife of the Danish Liaison Officer and an American Red Cross Gray Lady.

While Colonel Shields and the others attended to their official duties, we dined in the officers' club on roast Long Island duckling and a delicious pastry and took to our beds. We slept well, but only after darkening all

the windows against the circling sun. In a few hours we roused ourselves and, at 3:38 a. m., took off for the North Pole. Clouds gave way to brilliant sunshine, and, as we crossed Kane Basin to Washington Land, we could see clearly for a good 25 miles in any direction.

Our route passed directly over Fort Conger, where Lt. A. W. Greeley had passed two most successful years directing the United States Government magnetic and meteorological station. This was one of 13 circumpolar stations that 11 nations had established to make synchronous observations in 1892—the first instance of international cooperation in scientific field research that we know.

Only Seven Men Survived

His work completed and no relief supply ships having arrived by the appointed time, Greeley took his party to Cape Sabine as per instructions previously given him, and wintered there 1883-1884. Contrary to government promises no supplies had been placed there.

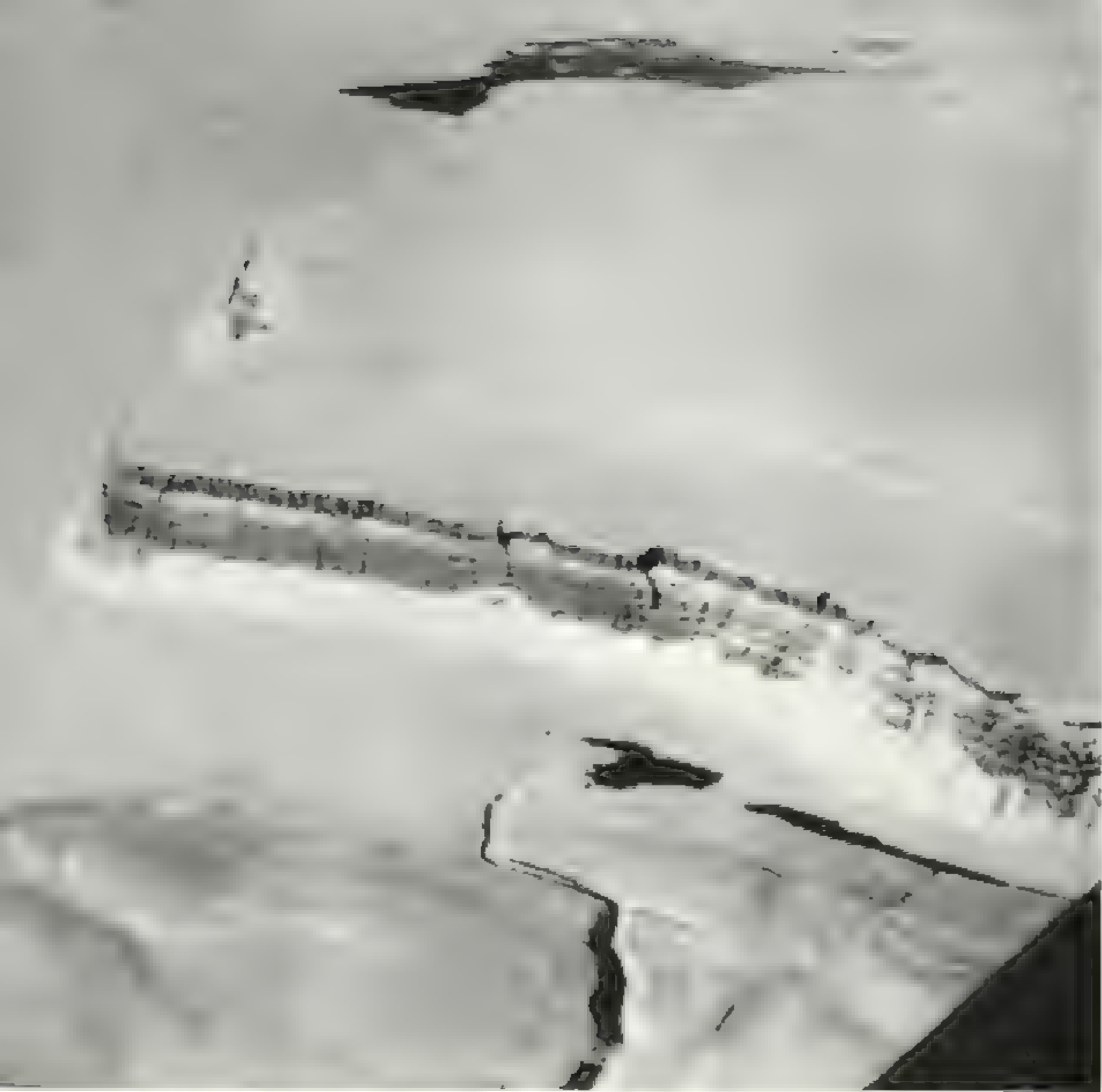
Of 26 men, 19 died. When relief steamers arrived June 22, 1884, Greeley and six others were barely alive. By heroic devotion to duty they had kept their records, instruments, and collections in good condition. Greeley was awarded the Congressional Medal of Honor, and was the first volunteer private soldier of the Civil War to obtain the rank of brigadier general, U. S. Army.

In 1888 he was one of 15 scientists to organize the National Geographic Society which he served as devoted trustee for 47 years continuously until his death in 1935.

North of the fort we passed over Lincoln Bay where Peary had set up the first of four main caches to support his dash to the Pole. Not far away we made out the snow-scraped runway of the tiny Canadian-American weather station at Alert.

Our plane let down to 5,000 feet, and the air waves sang with exchanges between our pilots and the communications personnel on the ground. No other sign of life, however, could be detected in a white waste. Alert's few lonely buildings sat numb and frozen, buried to the eaves in drifted snow.

Past Alert we cruised to Cape Colan, the third cache point, near 83° N, 67° W, and thence to the fourth and final base, Cape Columbia, Peary's last landfall between the North American Continent and the Pole (page 477). Here at 5,000 feet we circled, trying to spot the cairn of stones and sledge planks which Peary erected here. In the featureless mantle of snow we could discern nothing—though several days before, as it turned out, a pair of Canadian scientists



Troedson Chills of Cape Calhoun Advertise Entrance to Narrow Channel Splitting Danish Greenland and Canadian Ellesmere. Crimson Walls Rise 1,385 Feet

Charles Francis Hall, Sir George Nares, A. W. Greeley, and Peary drove their ships past this stinking promontory to safe anchorages close to the Arctic Ocean, 200 miles beyond. The photograph was made at 9,000 feet water the plane passed Humboldt Glacier, the world's largest known river of ice, which fronts 8,000 feet for miles. View looked on to the Arctic Ocean from the summit of a mountain.

trekking overland from Alert had located the cairn and recovered some of Peary's original records and a piece of the Flag of the United States that he had left on his unsuccessful dash to the Pole in 1906.

North of Cape Columbia the pack ice spread over the Arctic Ocean. Pressure ridges, rising zigzag lines across its flat, glistening surface, and the frozen sea or open leads of blue-black water scarred it with dark gashes. For the most part, however, we thought the going looked easier than the rough, tortured routes over Ellesmere Island which Peary had followed to get here.

The central section of this Arctic Ocean

forms a bumpy basin, which averages about 12,000 feet in depth but has quite a few sea mounts and valleys. Its lowest known point is slightly more than 10,000 feet; at the Pole it is 14,150. Tidal range is low.

Currents sweeping through the Arctic Ocean have long intrigued explorers. After Lt. Victor G. W. L. Lander, *U. S. S. Albatross*, came north to make a 1877-78 voyage, in 1881 Lander and his crew thought to be part of a wreckage were washed up three years later on Greenland's southern coast, at the other side of the Arctic (map, page 472).

But of Norway, which had the debris, has drifted either across or very close to the

Pole. Allowing his ship *Fram* to be frozen in the pack ice at about the point where *Jeannette* went down, he stayed aboard until it was carried 314 miles closer to the Pole. Then he struck out with Julianen on their nearly disastrous march to $86^{\circ} 14'$ in 1895. The *Fram* drifted as far as $83^{\circ} 57'$ and reached Norway safely under the guidance of Sverdrup.

Later, casks specially designed by Adm. George W. Melville and Henry G. Bryant were released in 1899 at Point Barrow, Alaska, and the Bering Strait and drifted west of Spitzbergen, presumably having passed within a few degrees of the Pole. One was found in Iceland in 1905, and another in Norway in 1908. More recently, discovery of fresh-water ice islands floating in the Arctic ice pack has given scientists an excellent opportunity to plot the general movement of polar currents.

It is now known that the main circulation of Arctic water is northward from Bering Strait to a little beyond the Pole. Here part of the current flows south through the Greenland Sea. The rest curves abruptly right and sweeps the northern coast of Greenland and the Canadian archipelago. Reaching the Beaufort Sea north of Alaska, it turns right and rejoins the flow out of Bering Strait.

The ice islands thus far located have been rotating around the Pole in this roughly circular current at about one mile per day; a complete circuit takes from five to six years.

A View of Ice Island T-3

It was thrilling to look down on the most famous of these islands, T-3, about one hour's flight from Cape Columbia. Only a few months earlier we had had the pleasure of working with Lt. Col. Joseph O. Fletcher, USAF, on his article, "Three Months on an Arctic Ice Island," published in the *NATIONAL GEOGRAPHIC MAGAZINE* for April, 1953.

Darker, thicker, and tougher than the soft, surrounding pack ice, T-3's great frozen platform showed up sharp and clear. Four by nine miles in size and weighing some four billion tons, it is a monstrous fragment of shelf ice torn from the primordial cap which once covered Ellesmere. Two other huge chunks that broke off from the same ice foot have become polar islands, too, floating across the northern seas. T-1 has drifted back to Ellesmere; T-2 crossed the Pole and at last report was somewhere off Greenland.

The U. S. Air Force, which discovered these vast ice rafts, maintains a post on T-3 for weather and geophysical research. Circling the ice island at 5,000 feet, we watched a plane take off from its resupply mission from Thule, chatted over the radio with the men below (was volunteer for four-month watches on this

barren but meteorologically important outpost), and gazed respectfully at their little huddle of Quonset huts, oil drums, tracked wessels, and radio masts.

Pools of melted water make landings on T-3 hazardous during much of the Arctic summer; so aerial missions must be crammed into a few short weeks. We said good-bye over the radio to our lonely friends on T-3 and pushed on toward the Pole, 300 miles distant.

Colonel Meyer, sitting near us, glanced at the pack ice. "When you've seen one pressure ridge, you've seen 'em all," said this veteran of 32 Polar flights. "From a hundred miles offshore to the Pole it doesn't change a whisker. And what's the Pole itself? Just a moment in time and space."

Last Lap to the Pole

As mile after frozen mile unreeled beneath us, however, excitement in the plane mounted. Noses pressed against the wind-chilled Plexiglas windows, we craned our necks to scan the dazzling white expanse of ice and water below. The sun stood at 20° above the horizon; not a cloud showed against the blue. It brought to mind Peary's entry in his diary when he was struggling south along the Greenland shore in 1901 with frostbitten face and food all but gone: "Man was not born to die beneath such a sky!"

Our radio operator continued to relay our position to Thule and to T-3. From our seats in the cabin we could hear the pleasant buzz of conversation, punctuated occasionally with a spurt of laughter.

"Al seems pretty cozy compared to our early flights up here," sighed Colonel Meyer. "We used to barrel along at 18,000 feet in complete radio silence for hours, just tapping a key to maintain contact with Point Barrow over in Alaska. Wasn't anybody up here to talk with. And cold! We always kept the cabin temperature near freezing, so the men would have all their arctic clothing on if we ever had to come down quick. Never saw another plane, or any sign of life at all."

Five minutes from the Pole the pilots told us to get ready. We checked our cameras again, and Grosvenor went forward to the radio operator's seat in the cockpit, which had access to a small chute ordinarily used for releasing smoke bombs to check drift. Charles Althoff at The Society's headquarters had attached a steel spike to the webbing of a big National Geographic flag and rolled it so that it formed a sort of padded spear (page 471). Now, quickly confirming our position, the navigator cried:

"Flag away."

Down through the chute plummeted The Society's banner. It was the second time it had

been planted by air on the earth's geographical North Pole; Byrd had dropped it first on the ice during his first flight on May 9, 1926. Now a new one surmounted the globe.

To celebrate the exact moment of passing the Pole, our plane commander rang the emergency bell for a hail out. Duly warned, we did not reach for our parachutes but simply for each other's hands. And we had reason to congratulate ourselves; we were assured that never had weather conditions been so favorable for obtaining a precise pinpoint of the Pole (pages 478, 479).

Flying into Tomorrow

"We are there," the navigators stated firmly. "No possible question about it."

It was a curious feeling. For a second we had lived at the one point in the world where there is no north or east or west, but only south; where in summer the sun neither rises nor sets.

At the time we flew over the Pole the temperature at our elevation was 0° F.; on the surface of the polar ice, an estimated 5° F., with a wind velocity of five miles per hour.

Turning left a mile farther on, we made at 7,500 feet a complete circumnavigation of the Pole at Latitude 89° 39' N. In this short counterclockwise swing we passed through every time zone in the world and every degree of longitude. In five minutes, we had flown from Wednesday, May 20, into Thursday, May 21, and then returned to Wednesday when we crossed the imaginary date line a second time.

The Roman writer Tacitus felt quite certain that anyone standing near the Pole could look eastward and see Phoebus, the sun's charioteer, rise from the other side of the world. "The sound he makes on emerging from the waters can be heard," declared Tacitus, "and the form of his steeds is visible."

Was for the classical view? We looked in vain. The sun, poised placidly in the sky, shone with a pedestrian light; no Olympian horses urged it along its Arctic orbit.

We had been interested in the positiveness with which our navigators had announced our crossing of the Pole. How could they have been so sure we hadn't passed to one side or the other? Our magnetic compass would have been of little use, for we were well within that area around the North Magnetic Pole (which lies at about 73° N, 100° W) in which the directive force is almost straight down and therefore not much help in controlling a horizontal needle.

Modern polar navigators use instead a directional gyro which maintains with reasonable accuracy whatever bearing it is set for.

Our navigators adjusted their gyro at Thule for the correct bearing, and then checked it every half hour by taking bearings on the sun. If we had been flying in the polar night, they would have taken fixes on the stars.

The reader may ask how our pilots could plot a true course in this northern area. For here all meridians (which run north to south) converge at the Pole, packed so closely together that an airman may scarcely have noted his crossing of one meridian before his plane has crossed another.

Again, suppose his plane is at the Pole itself and he wants to take a heading for New York. What compass bearing should he choose? You might say: due south, or 180°. But all meridians from the Pole are due south, and a 180° course could land you as easily in San Francisco or Helsinki as New York.

"How do you overcome this confusion?" we asked Colonel Meyer.

"Well, for one thing," he said, "we draw a grid across our polar chart. All meridians run equally north and south to the Pole, and one of them—say, the Greenwich meridian—can stand for grid north. Then we draw lines parallel to the Greenwich meridian three inches apart, and measure our direction in in these lines. This gives us a simple chart on which to plot our course."

"But it doesn't solve your basic problems of direction and position, does it?"

"No, though it makes it simpler to navigate on dead reckoning. To get accurate headings and accurate fixes along the course, we have to depend on the sun and the stars. Radio gives us our ground speed and our drift, but it isn't much use over the pack ice in determining our position, because there aren't any stable, recognizable landmarks."

"What do you do in the twilight weeks when the sun is below the horizon and the stars are pretty faint?"

Sky Compass Explained

"It isn't easy," said Meyer. "But by means of a fluid sky compass we are able to determine the aircraft's heading even when the sun is 6° below the horizon. This instrument operates under a principle utilizing two polarized lenses from which the direction of the source of light may be determined. Then we just keep a close check on our ground speed, elapsed time, drift, and so forth."

"How were you able to pinpoint the Pole on this flight so precisely?"

"Because we started the last lap from an exact fix—the Ice Island I-3—with a run of 300 miles to the Pole. What's more, we had the sun in sight all the way, to give us frequent position lines and heading checks, and we had the pack ice clearly in view below



Cape Canning's Mean Headland (Foreground) offered Peary a final Glimpse of Land sliding from Ellsworth's north coast, the Commander found his journey to the Pole March 1, 1909, a success. Flying in a L-4F plane on a 6000 ft mission, the authors retraced Peary's route in 1953.

to check our drift and ground speed by timing. Conditions, in short, just couldn't have been better.

Our plane wheeled southward headed toward Greenland. We busied ourselves writing letters to trustees and staff men and women of the Society, to Admiral Byrd, Commander MacMillan, and to various other interested parties long interested in Arctic exploration. These messages were later flown from Thule to Iceland and eventually postmarked 'North Pole.'

Greetings to the White House

One note we addressed to the White House (to read):

To President and Mrs. Eisenhower. We send respectful greetings and best wishes from the North Pole and Island T-3. The air base at Thule is superb and, as you know well, your Air Force operating here and over from U. S. A. superlative. (signed) Gilbert Grosvenor and Thomas W. McKnew.

Another message we were delighted to send went to Mrs. Robert E. Peary, widow of the Admiral, and to her daughter. It arrived, as it turned out, on Mrs. Peary's 90th birthday. Mrs. Peary was the first white woman to have

the rigors of an Arctic winter. She wintered with her husband in 1891-1892 and 1893-1894 at 70 miles north of Thule. Their daughter Marie Ahnighito Peary (Stanner) was the first white child to be born (September 12, 1894) at such a high latitude.

The 576-mile dog sled we were now following was taking us a good deal nearer the so-called 'European route' to the Pole than we had been on our northward course. To our left, far out of sight, lay Franz Josef Land, where Nansen had wintered after his unsuccessful attempt to drift across the Pole in *Fram*.

Still to our left, but nearer, rode the Island of West Spitzbergen. From its frozen surface Lindbergh and Berntsen took off on May 9, 1926 on their great mission. Three days later Lincoln Ellsworth, Roald Amundsen, and Umberto Nobile in the Italian dirigible *Norge* soared off on the last leg of their flight over the Pole to Alaska.

It required more than four hours to make our first landfall in east Greenland, a grim little weather station called appropriately and simply "Nord." It had an airstrip, we were told, but four feet of snow still covered it when we passed overhead. Nord is accessible during four and a half months of the year. For



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Grosvener's Flight aptly Enabled National Geographic Cartographers to Pinpoint the Pole

What does the North Pole look like? To children it is a candy striped signpost planted outside Santa Claus's workshop. To cartographers it is a point on the globe latitude 90° N. To polar navigators it is a position in time and space determined by complex calculations of ground speed, drift, compass errors, elapsed time, and celestial fixes. If it is the authors, being over the Pole 11:27 a.m. eastern standard time 1910 (Greenwich time) on May 1, 1943, it was a particular day in crystal ice in the vast, ever-shifting pack.

Mr. Grosvener took 33 photographs from the window of the Air Force C-34 as it flew curled the Pole counterclockwise at an average altitude of 7,500 feet (page 476). Painstakingly relating one picture to another by minute comparison of ice floes and open water, he plotted the position and angle from which he had taken each photograph. He was the first to locate the Pole from the air by a long photographic form all which later, plotting the lines of focus, he found they met at the Pole like spokes of a wheel at its hub. Above the center of the wheel he marked the Pole with a cross, the crosshair of a surveyor's level. The cross here shown by a circled cross, lower right.

For confirmation of the G. C. T. map of the U. S. Coast and Geodetic Survey, asked to check the computations, laid down a perspective grid on the photographs and embarked upon involved mathematical formulas. His conclusion: Mr. Grosvener was correct.

Illustration above shows long line of 100 stretching south from the Pole. Now as they appear here, the pressure ridges (white lines) on ice pack are 10 to 30 feet high. They have been thrust up by grinding floes (page 484). Each grid square is over 1000 feet along the side.

the other seven and one half, the volunteers who man its three tiny buildings must shift for themselves. They can receive supplies by airdrop, but only in dire emergencies do ski-equipped aircraft risk a landing there.

From Nord we veered to starboard, crossing beautiful Independence Fjord (discovered and named by Peary on the Fourth of July 1892) and skirting the northern tip of the vast icecap (page 481). This sheet of fresh-water ice, which covers nearly four-fifths of Greenland's 837,300 square miles, is reason enough for the ancient name: "Land of Desolation." The English navigator John Day called it after his voyage of 1585.

But this forbidding island drew sealaters and explorers and colonists to it from the very morning of history. Eric the Red and his Vikings, manning their shallow, 80-foot, square-sailed ships, headed their high prows

for Greenland as early as A. D. 983. For 300 years and more Norsemen settled the country some 1,000 miles south of Thule, established nearly 200 townships, prospered—and perished.

No man knows even now what struck them down. But by 1400 they were gone, remembered only as dim figures in the old, heroic sagas. Not till 1576, when Martin Frobisher saw Greenland's southern tip "like pinnacles of steeples all covered with snow," did European eyes look on Eric's country again.

After Frobisher came Davis, and in his wake a trio of English captains—Cunningham, Knight, and Hall—vainly commissioned by King Christian IV of Denmark and Norway to find the lost Viking colonists. A century later came the father of modern Greenland, Hans Poulson Egede, who founded in 1721 the first camp from which Denmark's chain of settlements would slowly grow.



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A Brown River Giraffe Down to the Port from Greenland's Heron Keep

[illegible]

Party on the First Great March Across the Desert (Described in *My Story* and *My Story*)

It was a fine day, and the sun was shining brightly. The party was made up of men, women, and children. They were all dressed in their best clothes. They were all very happy and excited. They were all looking forward to the journey. They were all very brave and strong. They were all very kind and helpful. They were all very good and honest. They were all very true and loyal. They were all very brave and strong. They were all very kind and helpful. They were all very good and honest. They were all very true and loyal.

the reconnaissance of that country. In a moment our wheels began to turn. It took us 30 minutes at an air take-off that morning. We had flown 1,000 miles—enough to have taken us from Thule to Dublin, Stockholm, Liverpool, or Oslo; almost enough to have let us pass over Warsaw, Moscow, Copenhagen, or Leningrad.

Thule's significance as a military air base was by now no novelty to us. Talking with officers, we were impressed by the importance of the logistical problem in maintaining these remote northern outposts. It was easy for us to see the need for these on the strategic aspects and to realize that such installations require far more than long-range direction from the Pentagon.

Radar to the Rescue

Already Thule has proved invaluable to the plane of other nations across the polar wastes. The radar defense net has helped many an uncertain navigator get his bearings and avoid directional errors which could be not merely tedious but tragic.

A dramatic instance came recently when a British four-engine transport carrying high-ranking officers from the Royal Air War College flew over the Canadian cup and landed as its way to Alberta. Flashed by low clouds and poor visibility, the pilot was puzzled. Thule came to his aid. Its pilot had taken over an instrument approach, and the hovering biplane kept from spiraling down low enough to be picked up by Ground Control Approach radar.

The only flaw lay in being taken down by Thule's defense radar unit. It was a United States. Unluckily, the unit had just been installing new equipment and it wasn't ready

Robert E. Peary National Geographic Society

WASHINGTON AND WASHINGTON
WASHINGTON, D. C.

VIA AIR MAIL

Mrs Robert E Peary
Mrs Marie Peary Stafford
c/o National Geographic Society
1146 - 16th St. N.W.
Washington DC



From the North Pole

We are at the exact spot
which your husband discovered 1908.
I wish to send you Mrs Peary, and Marie,
my love and gratitude for the friendship
with which Admiral Peary honored me.

Robert E. Peary

North Pole Mail Went to Mrs. Peary and Her Daughter

As the plane circled and circled above the clouds, with its gas running low, Charles and I men, feverishly reassembled our gear.

As the plane circled and circled above the clouds, with its gas running low, Charles and I men, feverishly reassembled our gear. An hour later the pilot radioed: "I see, chaps, our petrol is rather low. We'll have to ditch the aircraft." He had hardly finished however when the blip on spot of light, describing a loop, came out of the clouds and turned up at last at Thule's defense



Pearcy's Men Detouring Around an Open Lead, Eight Thousand Jumbled Pack Ice

In summer such ice cakes, often 200 feet thick and several miles wide, drift across the Arctic Ocean and, colliding with a summer ice zone, throw up huge pressure ridges (page 474). Once when wintering in Ellesmere Island's "Great Park," Percy noted that "yet & he who has risen . . . and gone to bed again by lamplight, day after day, week after week, month after month, can assure how beautiful is the sunlight."

Carefully, quickly, the defense unit men guided the pilot down, level by level, till the ground control operators were able to spot him and bring him safely onto the airstrip—with fuel almost gone.

While our own plane was being prepared for the long flight south, we dined at the officers' club and then took off at 11.50 p. m. in broad daylight, for Newfoundland. We took next morning winging our way across Laffin Island and down the coast of Labrador past Helton, Cape Musford, Nam, and Davis Inlet to Goose Bay. Then we dog-legged slightly eastward across the Gulf of St. Lawrence to Stephenville. It was a pleasant sensation after our long hours over ice and snow to step out of the plane into a brilliant spring day, but wet in warm sunlight.

From Newfoundland we cruised south along the length of Nova Scotia, passing near Baddeck, Cape Breton, the Bras d'Or Lakes, and the Grosvenor summer home, "Heilm Blrough." An over-water hop brought us a landing at Cape Cod's tip, and a short jog put us on the Boston-New York airway.

When we passed the steel-and-concrete forest of Manhattan, transformed by darkness and a million lights into a twinkling fairyland, we knew we were nearing home. An hour later we picked up the massive beacons of Washington—the red lights at the top of the Washington Monument, the round dome of the Capitol, the Potomac glistening under its six bridges—and made our approach to Andrews

Air Force Base, Maryland, near the Cap.

We had been gone some 94 hours, of which we had spent about 48 in the air and we had covered more than 8,800 miles.

Returning to headquarters, we were honored to receive our first letter of congratulation.

THE WHITE HOUSE

WASHINGTON

May 25, 1953.

Personal

Dear Dr. Grosvenor:

The greetings which you and Mr. McKnew sent me from the North Pole on May 20th were received by me at noon today. I am delighted at your thoughtfulness, and with what you say about the Air Force operations.

Please thank Mr. McKnew for his message.

With best wishes,

Sincerely,

Dwight D. Eisenhower

Dr. Gilbert Grosvenor,
National Geographic Society,
Washington 6, D. C.

This Strange Shangri-La Near the Himalayas Has Few Laws or Taxes
and No Army: Bridegrooms Take Most of the Honeymoon

By JEAN AND FRANC SHOR

With Illustrations from Photographs by the Authors

HIGH up under the roof of the world, where the towering Himalayas reach eastward to Tibet and the rugged Karakoram Range stretches west to Afghanistan, lies the remote and mysterious land of Hunza, peopled by a race whose origins are lost in time.

Hunza's boundaries are indefinite; its populated area lies along the Hunza River Valley, which is seldom more than a mile wide. Its 25,000 inhabitants are taller and fairer of skin than their neighbors; their agricultural methods are superior. They irrigate the rocky soil with water from melting glaciers by a system of canals which is an engineering wonder.

These people have a well-ordered and stable economy. A famous British physician has described them as the healthiest people in the world. They are, as my wife Jean and I found, certainly among the most hospitable.

Tribal War Causes Detour

We first stumbled into Hunza accidentally. Crossing the Pamir Plateau on yaks with a tribe of Afghan Kirghiz, we had found the border of Chinese Turkistan blocked by tribal warfare. Our military escort and interpreter had deserted us, but a Kirghiz chief lent us horses, yaks, and a guide he said would take us to Turkistan by another route.

We were weary, ill, and unsure of our whereabouts. But our guide led us over snow-capped 23,000-foot Dehli Sang Pass, down steep slopes into a narrow valley where green fields and orchards lined terraced cliffs. Villagers brought us food and gave us a bungalow in which to rest. We were in Hunza.*

The Mir, or King, of Hunza, Mohammed Jamal Khan, made us welcome.

"I think you will like our country," he said. "Our lives are simple but pleasant. We have few laws, almost no taxes, and no army. No one is rich, but neither is anyone in need. We are, I think, the world's happiest people."

The Mir urged us to remain and get better acquainted with his country. But the first snows were threatening to block the passes, and we had to leave. We accepted his invitation to return, but with little hope that we would ever again see his terraced valley.

In the spring of 1952, however, we visited

Pakistan on assignment for the NATIONAL GEOGRAPHIC MAGAZINE.† Pakistan controls Hunza's foreign relations, communications and defense, though the little mountain country is independent in internal affairs. We asked for permission to visit the Mir.

"I'm afraid there is little hope," a Pakistan official told us. "Hunza is a highly strategic area. It borders Chinese Turkistan and Afghanistan and is only a few miles from Russia on one side and India on the other. Technically it's part of Jammu and Kashmir. Some people might be suspicious if we permitted Americans to travel there."

By good fortune the Mir himself came to Karachi a few days later on one of his infrequent visits to the outside world. He assured the Pakistanis we would be welcome. Finally we found ourselves in the office of Kazim Raza, director of Pakistan's Intelligence Bureau.

"Do not think us rude," he said, "but people who want to visit strategic places are often not what they claim. After we have studied some of the articles you have written, we shall decide."

Toward Earth's Highest Peaks

In a week permission was granted. We sent a radio message to the Mir and flew north to Rawalpindi. From there a freight plane flew us to Gilgit, Pakistan's most important northern outpost (map, page 493). Syed Faridullah, political agent for the area, told us of developments since our previous visit.

"Hunza is still hard to reach," he said. "Until now there is a jeep road to Chalt, first village in the Mir's domain. That 32-mile trip once took two days; now it takes three hours. Eventually the road will go all the way to Baltit, Hunza's capital."

I was upset by the prospect.

"Isolation has been Hunza's salvation," I said. "Its people are healthier, happier, and better off than most in this part of the continent. The road might ruin the country."

"Don't worry," said Faridullah. "The Mir

* See "We Took the Highway to Afghanistan," by Jean and Franc Shor, NATIONAL GEOGRAPHIC MAGAZINE, November 1951.

† See "Pakistan: New Nation in Old Land," by Jean and Franc Shor, NATIONAL GEOGRAPHIC MAGAZINE, November 1952.



This Tash Valley, Aglow with Blossoming Apricots, Is the Heart of Idyllic Hunza

Centred in part of the mountainous region of Kashmir, the Hunzas spend their lives in the sight of some of the world's best mountain scenery. It is a place where the people are generous and hospitable.

is still an independent ruler inside his state, and no one could use the road without his permission. It will bring doctors and teachers to Hunza more easily and won't become an avenue for exploitation."

The next day Mirzih Hussain, a sturdy, 78-year-old Hunzakut who has served the Mir's family for 50 years, walked into Gilgit with a note from the Mir, telling us that horses were waiting us at Chalt. The note had been written in Baltit, 65 miles away.

"When did the Mir give you this?" I asked.

"Yesterday."

"And how did you get here?"

"I walked."

Syed Faridullah asked a question, then smiled as he interpreted the answer for us.

"He says he would have ridden a horse, but he was in a hurry!"

Rugged Highroad to Hunza

We left by jeep for Chalt the next morning. For a mile or two the new road ran smoothly beside the Gilgit River (page 488). Jean and I were in the front seat with the driver, while Mirzih sat proudly atop the luggage, which filled the rear. It was his first jeep ride, and he was bursting with pride, saluting right and left to everyone we passed.

A sharp left turn brought us into the Hunza Valley. The road began to climb. As it climbed it grew narrower, as it narrowed it grew rougher, and as it grew rougher Mirzih began to look worried.

No longer did he smile and wave. His expression grew grim. The road was now a mountain trail now, and every few feet a resounding jolt threatened to toss him into the canyon. I suggested that the driver slow down, but he was deaf to the idea. We skidded around a turn, knocking rocks and pebbles into space. Mirzih grabbed the driver and shouted at him. He stopped.

Mirzih staggered around a corner; after a long five minutes he returned, pale and shaken.

"Horse is better," he said, and reluctantly climbed aboard.

Jean and I came to agree with him. The road became a rocky ledge, blasted from sheer cliffs. We met one horseman, who was forced to ride back half a mile to a place wide enough for us to pass. Men on foot scrambled up rocky walls to make room. Only the driver was happy; he drove with gay abandon, taking his eyes from the road when he spoke to us and using both hands for gestures. We reached Chalt at noon, shaken, sore, and scared to death.

The Mir had arranged a reception. Muslim clans surrounded us with wailing pipes and thumping drums. Chalt's mayor, tall and

dignified, clad in a long wooden robe and sporting a brilliantly bearded beard, welcomed us to a little rest hangalow. Villagers, wearing the same flowing dress, smiled and saluted.

Inside the hangalow a lunch of roast partridge, hot flat bread, and fresh fruits and nuts was spread on a hand-bewn table. After we had eaten, we went into the courtyard and found our baggage loaded on two packhorses. Two other ponies, less than four feet tall, were saddled and waiting.

"Mir Sahib sends salaams," said the mayor. "Best horses. Very strong. Good journey."

It is only eight miles from Chalt to Maini, but the trail makes up in ruggedness what it lacks in length. After a brief and deceptively easy amble through a pleasant glade we followed the Hunza River and started up the Hunza road. This path, which stretches from Chinese Turkistan to Gilgit, has been known for a thousand years for its beauty—and its danger.

Centuries ago it was the chief highway from Kashgar to Kashmir. Daring traders led pack trains laden with silks, tea, and porcelain along its frightening summits and narrow galleries. Returning, they brought spices and gold and ivory. One successful round trip might make a man wealthy—but many a trader lost horses, goods, and even his life in sudden landslides.

Not far from Chalt we gazed at one of the world's most magnificent mountains. Rakaposhi, Goddess of the Snows, held her 25,550-foot peak proudly against the deep-blue sky. An awesome granite pyramid, mantled with snow, caps the unvanquished titan.

Land of Mountain Giants

Of the Hunza Valley, Lord Curzon wrote 50 years ago, "Within a range of seventy miles there are eight crests with an elevation of over 24,000 feet, while the little state of Hunza alone is said to contain more summits of over 20,000 feet than there are of over 10,000 feet in the entire Alps."*

Even among such giants Rakaposhi is inspiring. We stood on the 7,000-foot trail and looked upward three and a half miles at the wisps of snow whipping across its face (page 512).

We moved slowly that first afternoon. The trail alternately rose steeply and dropped with equal swiftness. As we moved upward along a sheer cliff, we came to our first gallery. These precarious bridgelike passages, whereby the Hunzakuts have created footroom where Nature had no such intention, have been

* *Letters From a Wrecker's Note-Book and Other Papers*, London, 1916; by permission of the publishers, MacMillan & Co., Ltd.



referred to as "triumphs of engineering." I think of them as triumphs of faith!

The principle of the gallery is simple. You are moving along a cliff face, perhaps 2,000 feet above a valley floor. You are on a rocky ledge, say two feet wide. The ledge narrows, then disappears; but 20 feet ahead it reappears. What do you do?

Hunakut trail builders long ago found a way to bridge these gaps. Usually there is a crack in the face of the trailless cliff. Into this crack they drive a line of flat rocks. On these they lay other rocks, the second layer protruding a bit. They add more layers of rock, interlaced with branches, until the level of the trail is reached. Thus a ledge is built, perhaps 30 inches wide—more likely 18—which is called a *rofik*, or *ribaty* (page 496).

Across Shaky Man-made Ledges

Men and horses cross these precarious perches. Our packers led the way; Jenn and I swallowed hard and followed. Looking down, I was horrified to see daylight through the rocks. From the next gallery I glimpsed several horses lying flattened on a ledge protruding from the cliff 500 feet below.

"Oh, yes," said the Mir, when I mentioned it to him later. "A gallery blew out in a wind. You were fortunate. I worried while you were coming; it was such a windy day!"

The resthouse at Maian sheltered two very tired travelers that night. Mirzah had walked ahead to prepare for our arrival, and we found him at the fireplace grilling skewers of lamb. Seasoned with cumin, it was delicious. We spread our sleeping bags on beds of crossed rawhide thongs and were soon dead to the world.

We began the 24-mile journey to Baltit at dawn. Above Maian the valley narrows, and the trail with it. Galleries came more frequently, each shakier than the last. At one corner the path was so narrow we had to unload the pack animals to make the turn. We were climbing steadily. Rakaposhi still towered above us, but more and more magnificent summits were coming into view.

Near midday a sudden turn brought us a view of Baltit. In the clear air its 600-year-old castle towered before us, seeming only a few thousand yards ahead.

"How far?" I asked Mirzah.

"Eight miles," he replied. "Three hours."

I glanced at my wrist. My watch was gone! I remembered that at midmorning I had felt something strike my boot, but had assumed it was a stone cast by the horse ahead. I started to rein up, then recalled the rocky trail. It might be 10 miles back; no watch was worth 20 miles of such travel. I would tell the Mir; he might send someone to look for it.

An hour later, as we slipped down a rocky slope, I heard a shout behind us. Down the trail at a steady trot came a barefoot Hunakut. He spoke briefly to Mirzah, then came to me and held out my watch.

"Sahib?" he asked, pointing to my wrist.

I looked at my wrist, pretended surprise, then showed him the strap marks. Replacing the watch, I thanked him profusely.

"How far?" I asked in Urdu, pointing to the watch.

He named a village eight miles back. Gratefully I brought out a handful of Pakistani rupees. He took them.

"Nay, sahib," he said, firmly. He seized my hand, shook it warmly, and was trotting back along the trail before I could stop him.

He left us near a broad green valley where terraced fields step down to the shore banks of the Hunza River. One by one. A row of cool and apple trees, heavy with blossoms, lined the last mile of the trail. Mirzah led us promptly into the grounds of the Mir's new palace. Fifty yards from the doorway an arch over the path spelled out "WFL—COME" in red letters. The Mir, dressed in flannels and a tweed jacket, came to meet us.

"Welcome home," he said. "We have always been sure you would return."

The Mir is short and squarely built, with dark hair and eyes and a ready smile. He studied English at a British school in Gilgit and speaks it perfectly. Besides Burushaski, the Hunza tongue, he is also fluent in Persian, Urdu, Arabic, and half a dozen dialects of surrounding tribes.

He lives simply. His ancestors owned most of the land in Hunza Valley and collected a tax on the rest. The Mir has given most of the land to the men who till it and collects only a small rental from the lands he has distributed.

Modest Castle in Western Style

His new castle is a modest structure built of hand-hewn Hunza granite in Western style. It is comfortably furnished in a Pakistani version of modern. One of the Mir's proudest possessions is an upright piano.

"My grandfather had it brought from Kashmir," he told us. "Twenty men carried it over the mountains."

That night, as we sat in front of a roaring fire, the Mir told us a little about his country and his people.

"We have no written history," he said, "but legend tells that we are descended from three soldiers of Alexander the Great who took Persian wives and settled here 2,000 years ago. We have no proof of this, but some scholars say our people bear a strong resemblance to the ancient Greeks."

"Sir Aurel Stein studied our language and concluded it bore no relation to either the Indian or Iranian language families. Our customs and culture differ from those of our neighbors. We are taller and stronger than they, and our farm methods and sanitary habits are in step with modern Western discoveries."

From a bookshelf the Mir brought down a half-bound typewritten folio.

"My grandfather wrote this," he said, "It is the story of the descent of the rulers of Hunza, going back 40 generations. He was the first man who *could* write it down. It is full of old tales—of one Mir who ate young children, and of another who was put in a box on the river and was fished out downstream like Moses.

"In the old days we were great warriors. Even the Chinese empire, at the height of its glory, sent tribute to the Mirs of Hunza to keep them from raiding Kashgar and Yarkand in Chinese Turkestan."

Today the Hunzakuts are a peaceful race. Long ago the Mir disbanded the state's little army. A few years ago he did away with his personal bodyguard.

"Why should I have a bodyguard?" he asked. "I have no enemies. Any man in the country can walk into my office at any time. They bring their problems to me, and I try to help them. The most important thing about Hunza, I think, is this: we are a contented people. There is enough for everyone to eat and wear, and when there is a shortage we share what we have. Only once since I became Mir have we been worried."

"What caused that?" I asked.

"Two years ago," the Mir replied, "someone thought he had discovered a rich vein of gold. Fortunately, it turned out he was mistaken, but for a few days we were alarmed."

I found it hard to believe that anyone would object to owning a gold mine, and I said so.

"It would have meant the end of Hunza and our way of life," the Mir explained. "We are let alone because we have nothing anyone else wants. If we were rich, some country would find a pretext for moving in to 'protect' us."

Central Asian Hall of Fame

Before we went to bed that night, the Mir brought us his guest book to sign. Jean opened the yellowed pages and gave a cry of delight. The book was a hall of fame of Central Asian exploration. Sir Aurel Stein, Lord Curzon, C. P. Skrine, and Sven Hedin were there. Theodore and Kermit Roosevelt had left their signatures. Maynard Owen Williams, of the NATIONAL GEOGRAPHIC MAGAZINE, had signed it with fellow members of

the Crown-Princess Trans-Asiatic Expedition.* Proudly we added our names, in small letters.

Mirzab woke us early the next morning. We came into the living room to find the Mir waiting, dressed in a magnificent gown of gold brocade belted at the waist. At his side hung a gold-hilted sword in a scabbard of curved ivory. A jeweled pin held a plume of egret feathers in place on his black cap (page 508). Ayash, his younger brother and right-hand man, wore a similar costume. Even Crown Prince Mohammed was in full regalia.

Festival Starts Spring Sowing

"Today is our spring planting festival," said the Mir. "A Hunza custom hundreds of years old. We'd like you to attend."

After breakfast we walked to a field where hundreds of villagers had gathered. Two black oxen, scarcely larger than six-months-old Angus calves, were hitched to a wooden plow. The Mir's grand vizier, an 80-year-old dignitary with long mustaches, was waiting. With him was a teen-age lad, who looked as if he were made up for Halloween.

Flour covered the boy's face, hands, and the U. S. Army jacket he was wearing. On his back a bag held a bundle of green branches. Another sack contained barley.

Villagers cheered as the Mir grasped the handle of the plow. The grand vizier made a brief speech. The Mir responded, then drove the oxen down the field and back, plowing a shallow furrow.

The grand vizier took a handful of seed from the youth's pouch and placed it in the Mir's cupped hands. From a purse he drew a pinch of gold dust, which he mixed with the seed. The Mir broadcast the mixture over the new furrows, while the crowd shouted.

Three times the ceremony was repeated. Then the Mir threw a few handfuls of grain over the crowd and the villagers scrambled madly for the ceremonial seeds. The Mir spoke again and the crowd dissolved, the men trotting off for their own homes.

"Now they will sow their own fields," said the Mir. "They believe that if they catch a few of the grains I throw and mix them with their own seed, they'll have a fine harvest."

"Do you believe it?" I asked.

"If the weather is good, with plenty of water, and they till the fields well, they will have a good crop," laughed the Mir.

The youth with the flour, seeds, and green shoots is a Hunza symbol of fertility, the Mir explained. His position, one of great honor, is hereditary.

From the Mir's balcony an hour later we

* See "First Over the Roof of the World" by Maynard, by Maynard Owen Williams, NATIONAL GEOGRAPHIC MAGAZINE, March, 1932.

could see hundreds of farmers sowing their fields (page 504). The seeds were thrown on the plowed soil, then even dragged masses of thorn bushes across the fields.

At dinner we sipped delicious Hunza wine. Most Moslems drink no alcohol, but the Hunzakuts are followers of the Aga Khan, members of the liberal Ismaili sect.

'Our people make a little wine each summer,' said the Mir. 'In December, when it is too cold to farm, they drink their wine. They also kill a sheep. It is one of the few times in the year they eat meat.'

December is festive in Hunza. Each evening villagers gather for the famous Hunza sword dances, and the merrymaking lasts for the entire month. All marriages are performed in December, too.

A Hunzakut husband can never forget his wedding anniversary, for all weddings take place on the same day. On a mid-month Thursday, chosen in consultation with the diviners, engaged couples of each village gather for a mass ceremony. Hunza parents still select marriage partners for their children, but the young people can refuse their parents' choice.

'We have one custom which Westerners find unusual,' said the Mir. 'The groom's mother spends the honeymoon with the newlyweds, acting as guide and teacher. Marriage, we believe, is too important to be left to chance. We have very few divorces.'

Women, Men Have Equal Voice

Women play an important part in Hunza life. They cannot inherit land, since the Hunzakuts feel they could not do the heavy work of tilling the fields. They can own other property, however, and they have an equal voice with men in family matters. The Mir's wife is in purdah and is never seen by men, but other women of the country move about freely without veils. They are shy, but smile and salame to the passing traveler.



Sky-high Hunza Borders Afghanistan and Red China

Three great mountain ranges—Hindu Kush, Karakoram, and lofty Himalayas—converge on this remote Central Asian kingdom. Set apart by unclimbed peaks, deep gorges, and harrowing trails, the Mir of Hunza's domain has no definite boundaries. External affairs are handled by Pakistan.

This equality extends to education, too. Hunza is one of the few places in all the East where there are free schools for both boys and girls. The Aga Khan earmarks funds for educational purposes, which are administered by the Mir.

Good soil is so scarce in Hunza that a too high birth rate would be serious. Centuries ago, however, the Hunzakuts solved the problem of birth control. When a woman becomes pregnant she leaves her husband's bed, not to return until her child is weaned—two years for a girl and three for a boy.

One sunny morning we attended a session of the Mir's court (page 507). Each day the ruler and his advisers meet in the palace courtyard. A council of 12 aids the Mir and his grand vizier. Most of them are very old. One bearded-headed elder, who walks two miles every day to attend the council, is 97½

[illegible]

Bunks Were Favored in Hunza Long Endure Manne Set a Style

[illegible]

Although they are Mr. and Mrs. Herman Cohen, 41 and 42 years old, the couple in Hialeah have developed a slender pluckiness in hard work to keep a few dollars in the bank their barren prospects for a child.

a dozen others are more than 30 (page 491).

"Our government is democratic," the Mir told us proudly. "Each village selects a mayor. He and his council decide local disputes. If the contestants aren't satisfied, they appeal to me by telephone."

"How do you happen to have a telephone system here?" I asked.

"My grandfather had a battery-powered line installed," answered the Mir. "There is one phone in each village. I call each mayor for a daily report. In an emergency they can call me. All but one, that is."

"Why all but one?"

"He's too talkative," laughed the Mir. "Used to call a dozen times a day about trivial things. I had his telephone fixed so I can call him, but he can't call me. It works very well."

How Disputes Are Settled

If a telephone decision isn't satisfactory, the contestants walk to Baltit and present their claims in person. We saw three cases decided, two involving water rights and one a question of land inheritance. In two instances the Mir suggested a compromise, which both parties accepted. In the third case the contestants embraced, kissed each other on the cheek, and left arm in arm.

The last case was put to a vote of the council, and the Mir accepted the majority decision. The losing litigant waved his arms and shouted angrily. He stomped off, yelling his opinion of the court to anyone who would listen.

"That," said the Mir, "is the local equivalent of a free press."

Jean and I spent a week in Baltit, getting acquainted with the villagers and watching them till their fields. One farmer, Nazar Shah, invited us into his room and took care for lunch. We became friends and spent several days with his family.

Nazar Shah owns 10 *kharabs* of land—a little more than two acres. He raises barley and potatoes, the two chief crops, and smaller amounts of millet, wheat, and gram. Carrots, turnips, and green beans are raised in spring and early summer. His trees yield apricots, pears, apples, and walnuts.

Eight sheep provide milk for the family of seven, wool for their homespun garments, and manure for fertilizer. Two sheep are killed for meat during the feast month of December.

Proudly Nazar Shah showed us his square two-room, two-story house. A ladder connects the two chambers.

"All Hunza houses are built like this," he said. "The lower room has only one small window and is easy to keep warm. We live there all winter. Every year, on the 21st of

March, we move upstairs, where we have a balcony with a view. There is a Hunza saying: 'Better a home with no roof than one with no view.'"

All Hunzakuts move upstairs on the same day. Even the Mir's palace has duplicate apartments on two floors, and the royal family makes the annual move, too.

Outside, Nazar Shah showed us a rock shelter for his sheep, and two snug storerooms. One held dried apricots and jars of grain, from the ceiling hung strings of pears. Our host handed us each one. They were wrinkled, but tasted as fresh as if picked that day, rather than six months before.

Part of the storeroom was walled off and contained smaller quantities of grain, fruit, and nuts. We asked why the separate supply.

"That is for others, in an emergency," said our host. "Everyone in Hunza sets aside a small portion of his harvest to help others who may meet with misfortune."

Soni Begum, Nazar Shah's wife, prepared our simple lunch. Two handfuls of dried apricots were soaking in a wooden bowl. While her daughter-in-law, Feroza, cracked flat rounds of unleavened bread on a stone, she rubbed the apricots briskly between her palms in the water. The fruit softened, and the water thickened and took on the color of the fruit. When the bread was done we were each given two pieces, and a few apricots and a cup of the liquid were placed before us.

The fruit was delicious. I started to throw away the seed from the first one, but Nazar Shah seized it, cracked it between two stones, and handed me the kernel.

"Eat it," he said. "It's the best part."

It tasted much like an almond. Jean and I ate our fruit, kernels and all, and then, following the family example, we drank the liquid. A handful of walnut meats finished the meal.

"This is the mainstay of our diet," said Nazar Shah. "We eat potatoes, some vegetables, and a little grain. But fruit and nuts are the most important. Maybe that's why Hunza girls won't marry a man who lives where apricots won't grow."

Fruit Trees for Wedding Gifts

The apricot is so important in Hunza's economy that trees can be given or willed separately from the land on which they stand. Frequently a daughter is given a special tree as a wedding present. Every year she returns to pick its fruit.

Nazar Shah's family is almost completely self-sufficient. They raise their own food, and Soni Begum makes the family's woolen clothes. She shears the sheep, spins the yarn, weaves the cloth, and makes it into garments.



APRIL 10, 1907

1907

Invitation to Vertigo: Precarious *Rafks* at Dizzy Heights Test Travelers' Nerves

Each time they mount the new trail, or a key, part of some rock, into the side, a crowd of onlookers—mostly of the same sex—gathered to witness the feat.



Before Genghis's Slammed Western China's Door, Her Caravans Went This Way to India

The image shows a caravan of people and pack animals crossing a stone bridge over a deep, rocky gorge. The scene is set in a rugged, mountainous landscape with steep cliffs and sparse vegetation. The bridge is a simple stone structure, and the animals, likely mules or horses, are carrying large packs. The overall atmosphere is one of a remote, ancient trade route.

only cotton cloth is purchased. Nazar Shah seldom handles more than \$15 or \$20 a year in cash.

The *hastani rupee* is the currency of Hunza. When the Hunza road was open, the villagers made a little cash by renting horses and serving as porters for the caravans from Chinese Turkistan.

Ancient Caravan Route Closed

These caravans also served as traveling bazaars, where Hunzakuts could buy utensils, salt, knives, and brightly colored cotton cloth. But the Chinese Communists have closed the border, and the road is little used. Hunzakuts must make the long trek to Gilgit for their few purchases.

Fortunately, the remarkable physique and great endurance of Hunza's mountain people make a long journey on foot a trivial matter to them. Jean and I had read fantastic tales of their endurance, and we asked the Mir if they still had such stamina.

"You may see for yourself," he said. "I am sending a messenger to Gilgit in the morning. Give him a note to the political agent and ask the agent to write down the time of his arrival."

The round trip between Baltit and Gilgit is 150 miles over difficult trails. The messenger, a tall and slender youth of 18, left at 8 in the morning. He returned three days later. Syed Faridullah had written the time of arrival on my note—with a humorous protest against having been awakened at 3:30 in the morning. The messenger had walked the 65 miles to Gilgit in 19¼ hours!

Later, Jean and I told the story to an English journalist in Pakistan.

"Ah, yes," he said. "Rather good time. But then, it was downhill, wasn't it?"

Living with the Mir was pleasant, but there was more of Hunza to be explored. So with Mirzah and Nyet Shah, a magnificent specimen of Hunza manhood, we set off toward the Chinese border.

Nyet Shah is in his early thirties, six feet tall, broad of shoulder, and long of mustache. He walked as we rode, carrying 40 pounds of equipment on his back, and frequently enlivened the march by dancing a mile or two to show us Hunza steps. He loved to be photographed—if we gave him warning so he could curl his mustache (page 494).

There were times when language problems grew a bit complicated. The Hunza tongue is amazingly involved. It has, among other difficulties, at least four genders and a bewildering confusion of plural endings.

Both Mirzah and Nyet Shah speak good Urdu and some Persian and Turki, and I have a smattering of all three. I speak Chinese,

and they know a few words of that. Mirzah had once been employed in the British Consulate General in Kashgar, but had forgotten most of his English. Nyet Shah knew no English, but said he'd like to learn. The result was frequently a strange mixture, such as I found myself speaking our third night out:

"Farda (Persian: Tomorrow) man (Turki: I) yao (Chinese: want) teek (Urdu: good) khaur (Burmese: horse)."

It sounded a little odd, and it frequently sent Jean into hysterics, but it worked.

We paused briefly at Altit, a couple of miles from Baltit, to inspect a 500-year-old fort. Its mud walls were still in good shape, the sturdy beams and timbers intricately carved in geometric patterns. The Mir uses the structure as a storehouse.

Pied Piper of Hunza

As we left Altit, shouting schoolboys fell in behind us, laughing and scrambling on the narrow path. To our amazement they followed us the entire seven miles to Atabad.

"Foreigners must be rare up here if they'll walk all that distance just to look at us," said Jean. "Let's give them some candy."

I walked to my packhorse, where I had a few pounds of hard candy in the pocket of my trench coat. I put my hand in—and found a lone piece of candy and a sizable hole.

A closer inspection of our young escorts revealed bulging cheeks and hands clutching the brightly wrapped confections. A Hunza man may walk eight hard miles to return a valuable watch, but, where candy is concerned, boys are boys the world over.

The 11 miles from Atabad to Gulmit were a nightmare. Between 1,000-foot climbs up almost sheer cliffs we stumbled over rocky stretches of riverbed and dragged our horses through deep sand. Three miles from Gulmit we reached the most fantastic bridge I have ever seen.

xx rusty cables stretched some 300 feet across the Hunza River, about 500 feet above the water. Two cables served as handrails, the others supported a narrow, weathered and cracked plank, which were the footpath. The branches were spaced irregularly, usually

In Informal Hunza Both Sexes Have Their Say

Just as the Mir of Hunza has his council of elders, his wife meets each day with a group of Baltit women to discuss the problems of the feminine populace. These matrons, sitting on a corner of the Kand's garden wall, are among her closest friends. Behind them towers a giant unclimbed peak.

The Kand herself is in *pardah*, the only woman in Hunza to be kept from public gaze, and cannot be photographed.

A National Geographic Society
publication by Jean and Freda Steg. National Geographic Staff



far enough apart to require a long stretch.

I crossed the bridge to photograph a village, but Jean wisely refused. A high wind was blowing, and the old cables creaked as they swayed (page 306). The footpieces gave beneath me at each step. It was a road day, but I returned drenched with perspiration. Nor did I feel better when, as we rode off, a Hunza woman came tripping across with a baby clutched under one arm.

Dinner in Gulmit was a feast. The mayor presented us with a haunch of ibex and a brace of partridge. Mitzah made soup of the ibex bones, served the partridge grilled on skewers, and then brought roasted ibex.

The Mir telephoned that night. "My shikari (hunter) in Pasu has just called," he said, "to tell me that Marco Polo sheep have been sighted a few miles from the village. It's a chance to get some meat. Would you like to go along?"

The prospect of even glimpsing a rare *Ovis poli* elated me. I assured the Mir I'd like to join the party.

"I'll tell the shikari to wait for you," said the Mir.

I rode ahead of Jean and the packers the next morning, covering the eight miles to Pasu before 10 o'clock. The shikari and two trackers were ready. They presented me with a 6 foot pole topped with a steel point and hook for climbing, and we set off.

The Mir of Hunza is an honest man, and when he said that the *Ovis poli* were "a few miles" from Pasu, I'm sure he meant just that. But he failed to mention that most of those few miles were straight up.

Tracking Marco Polo Sheep

We walked along the Hunza road, then turned into the valley of the great Batura Glacier, one of the world's largest. This great mass of detritus-covered ice, nearly 25 miles long and four miles wide, fills the valley. We straggled across it for two hours, then left the trail and headed up into the mountains.

I was in good condition, but my Hunzakut friends found my progress slow. The shikari stayed with me, but the two trackers ranged ahead like hunting dogs, moving in huge circles, traveling at least three times as far as I did, yet never showing fatigue.

Pasu village lies at 8,000 feet; at dusk we had reached 16,000. We paused for half an hour, ate a handful of dried apricots and a few walnuts, then resumed our steady climb.

We made another 1,500 feet in the next three hours. The Hunzakuts were ready to go on all night, but I was through. My feet were leaden, my lungs hurting, and my heart pounded a rumba rhythm. I scooped a hole for my sleeping bag and turned in. My com-

pations wrapped up in their long robes and lay down; we slept soundly until dawn.

Then Tair Shah, the shikari, roused me. I was so stiff and sore I could scarcely unzip my sleeping bag. I finally managed to stand up, and after more apricots and walnuts we set off up the mountain.

The jagged granite peaks turned a rosy gold in the sun's first rays. Below us the valley was still shrouded in semidarkness. The going was even rougher now, but the beauty of the scene and the crisp morning air gave me new strength. An hour of steady climbing brought us to 18,500 feet, where Tair Shah called a halt and sent a tracker ahead to the crest of a slight ridge. The tracker crawled the last few feet, peered across, then silently motioned us to his side.

Sheep Sighted from Ridge

Quietly we crept up beside him. I lay flat on the ground, inched to the crest, and cautiously peered over. About a quarter of a mile away, standing quietly in a little snow meadow, were seven Marco Polo sheep—four ewes and three rams. The wind was toward us, and they showed no sign of alarm.

Few animals compare in grandeur with the *Ovis poli* ram. His body is often as large as a donkey's, with a great head and magnificent curved horns. The world-record head, taken not far from where we lay, had horns 75 inches around the outside curve.

These animals were not that large, but they were big. The thought that I was one of the few Westerners to see them in their native habitat sent a thrill down my spine.

I lay quietly for a minute, waiting for my pounding heart and gasping breath to smooth out.

Slowly I squeezed the trigger. The crash echoed back and forth from the towering peaks. I waited a long and awful moment while the bullet sped its course.

Suddenly the grazing animals leaped as if propelled by springs. Straight up the side of a sheer rock wall they hurtled. All that is, but the great ram. He stood motionless for a second, then collapsed and tumbled silently down a rocky wall.

Trophies Without Heads

Tair Shah fired, and one of the young rams collapsed in mid-flight. I did not fire again.

The two dead rams were only a quarter of a mile away by rifle shot, but so rugged was the terrain that it took our trackers nearly two hours to work their way to the spot and return with the carcasses. I lay down to rest.

In spite of my excitement I dozed off. Tair Shah woke me when the men dragged the

(Text continued on page 317)



A Hunza Woman Knits Homespun Yarn with Needles of Modern Plastic



Books (Each in Old-time & New)

[illegible][illegible]





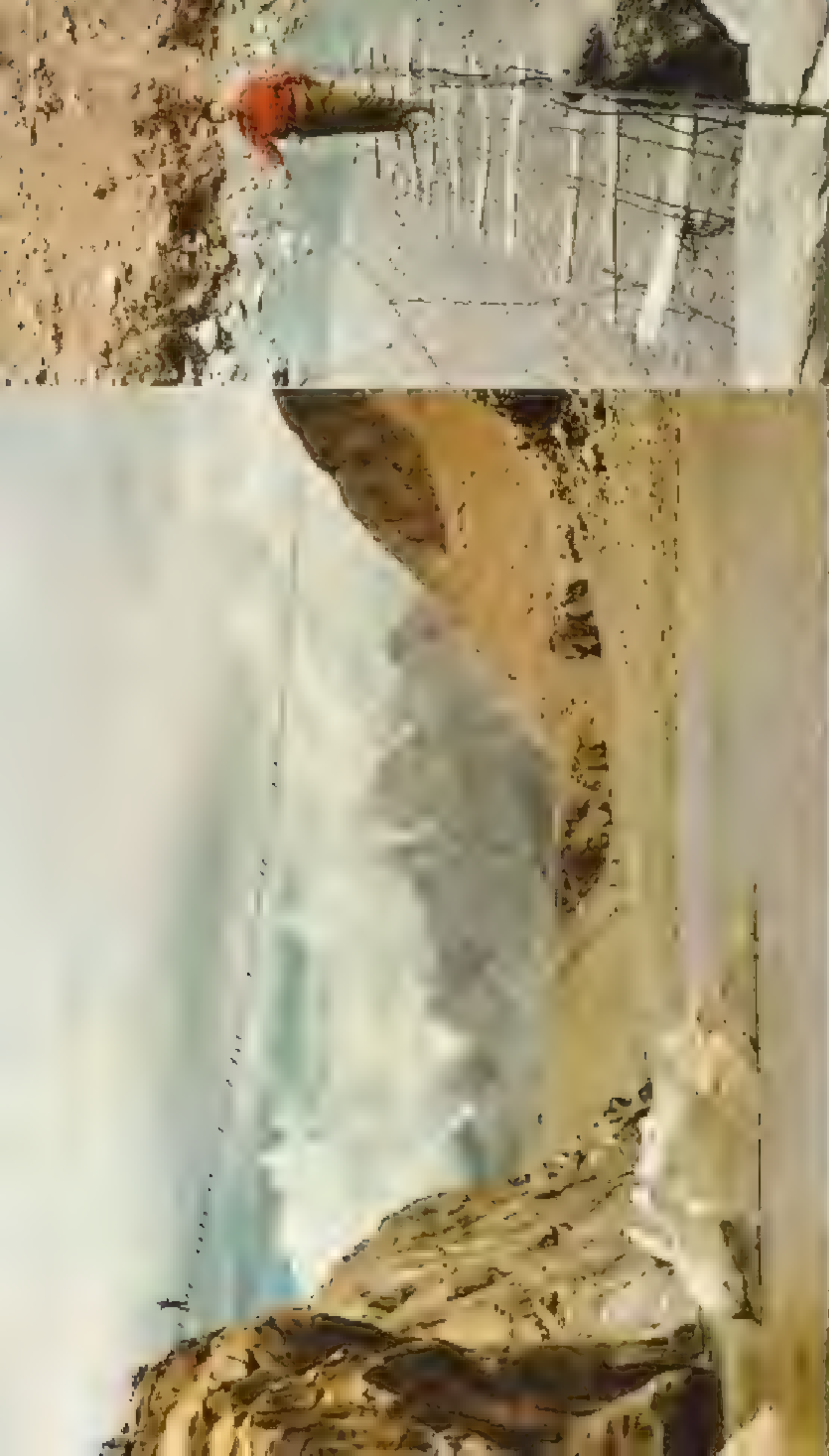
When Fields Need Watering, Farmers Hope for Sunny Days!

It is not so long ago that the farmers of the West were not so much interested in the weather as they are now. They were content to let the weather do as it pleased, and to let the crops grow or not as they pleased. But now, when the weather is so much a factor in the success or failure of the crops, the farmers are much more interested in the weather than ever before.



Sometimes the Rugged Land Is Sown Before It Is Plowed

Sometimes the rugged land is sown before it is plowed. The farmer sows the seed in the rough, uneven ground, and the seedlings grow up in the cracks and crevices of the rocks.



"Hurry and Cross," Said Jean Shor. "I Don't Want to Be a Bridge Widow!"

As Jean Shor swayed far above the Thurne River, his wife took the pantograph. To ward cables support cross-pieces of wood set a full step apart (right). After one round trip, she shut down a better view. Never again.

Democracy Works in the Land of the Gentle Giant

the authors have been able to find no other studies that have compared the use of a video with a written manual for teaching a new skill. The authors have also been unable to find any studies that have compared the use of a video with a written manual for teaching a new skill. The authors have also been unable to find any studies that have compared the use of a video with a written manual for teaching a new skill.

25





Hemayat Khan, Ruler of a Pocket-size Kingdom. Mirza's Mir Speaks Flowing English

Hemayat Khan, ruler of a pocket-size kingdom, is seen in the foreground. Mirza's Mir, who speaks flowing English, is seen in the background. The Mirza's Mir is seen in the background.





1. *Wanted in Boston*
 2. *Wanted in Kent*
 3. *Wanted in New York*

1. The first step is to identify the problem. This involves understanding the current situation and the goals that need to be achieved.

**Theresa Smiley
Keefer Consulting
and Chaper**

[illegible]

• A number of factors may be responsible for the observed decline in the number of children with autism, including:

[illegible]



Wakamshi, "Goddess of the Snows," Towers Above the Turned Breadbasket of Thava
 Grain and fruit are basic foods, meat is tasted only a few times each year. Here, in the broadest part of the valley,
 the people are the most numerous and the most fertile.



"Starvation Spring Time" Brings Blossoms but Little Food to Hungry Farmers

When the first blossoms of spring came, the farmers in the mountainous regions of China were still suffering from the effects of the famine. The fields were still empty, and the people were still hungry.



2011. 12. 14. 14. 14. 14.

Processed Fruit Snacks Sample Are the Year Round

The first of these is the fact that the majority of the population of the United States is now living in urban areas. This is a result of the process of urbanization, which has been going on since the beginning of the 20th century. The second of these is the fact that the majority of the population of the United States is now living in the South and West. This is a result of the process of migration, which has been going on since the beginning of the 20th century. The third of these is the fact that the majority of the population of the United States is now living in the middle class. This is a result of the process of social mobility, which has been going on since the beginning of the 20th century.





Y and Virginia Ave
Alice the Wood Chae

"Went to the Mar
to see the old man
Hudson and his wife
and his son. He was
very old and his wife
was very old. They
were very old and
they were very old.

A very old man
and a very old woman
were sitting on a
bench. They were
very old and they
were very old. They
were very old and
they were very old.

A very old man
and a very old woman
were sitting on a
bench. They were
very old and they
were very old. They
were very old and
they were very old.

A very old man
and a very old woman
were sitting on a
bench. They were
very old and they
were very old. They
were very old and
they were very old.



Gay Fairs and Silver Silks Frame the Face of a Matron.

The woman is wearing a green and red patterned shawl and a green and red patterned headscarf. The face is framed by a green and red patterned shawl. The background is a soft, out-of-focus landscape with green hills and a blue sky.

animals in. I took one look and let out a scream of anguish.

"The heads!" I shouted in Urdu. "The heads! Where are the heads?"

The trackers had decapitated both animals, bringing back only the bodies.

"Why the heads?" asked Tair Shah. "They are heavy, and you cannot eat them."

My Urdu was far too meager to explain, so I pointed toward the spot where the rams had fallen and firmly repeated the word for head. Tair Shah gave me a peculiar look, but sent the trackers back with orders to bring the carcasses, heads and all, to Pasu.

It took the shikari and me six hours to slide down the cliffs and cross the glacier to Pasu. Soon after our return the trackers walked in, each carrying nearly 200 pounds of sheep. Neither seemed the least bit tired.

The horns of my ram measured 47 inches around the outside turn, a creditable trophy. Excitedly I telephoned the Mir of our luck.

"I am very happy," he said. "Now you will return in good spirits."

"We don't plan to return quite yet," I said. "I think we'll go on to the Chinese border."

"It would be better if you did not go farther," he replied. "You are only a few miles from the Communist border post, and it is unsettled country. If they knew Americans were so near, they might be suspicious."

I promised we would start our return journey the following day.

I napped the rest of the afternoon. Not so Tair Shah. Word had come that ibexes had been seen near the village, and he set off with three companions. At 9 that night there was a knock on our door. I opened it to find the shikari and his friends, each with an ibex slung over his shoulder and the head in his hand. They piled the heads, with long, curving horns, on the porch.

"The Subh likes heads," Tair Shah explained to Mirzah, who was looking on in astonishment. "How do you cook them? Or is it only the eyes he likes?"

Mirzah explained the Western fondness for trophies; Tair Shah looked much relieved.

Polo: Hunza's National Sport

At Mirzah's suggestion we walked to Tair Shah's house. There four still-warm ibexes were stretched on their backs. Men held them by the legs while women combed the bellies and sides of the animals. Every few minutes they removed a thick mat of hair from the curbs and put it in a woolen bag. Mirzah handed us a ball of it.

It was the softest wool I had ever felt, far lighter and silkier than cashmere. The combing leaves the coarse guard hairs, plucking only the precious down.

Back in Baltit the Mir staged a two-day farewell party for us. Polo is Hunza's national game, and a rousing two-hour contest between the best teams in the country was the first-day feature. The play was wild and reckless with the most daring horsemanship I have ever seen.

Level ground is rare and precious in up-and-down Hunza, but every village has its polo field. Children play first on foot, then on donkeys, and finally on horseback when they are old enough. Every village has a team, and inter-village rivalry runs high. A top-notch player is as much the idol of Hunza youngsters as a major-league star in our country.

Archery and Flashing Swords

In the afternoon came exhibitions of horsemanship. The feature attraction was a mounted archery contest. Horsemen thundered down the hill at a dead run, firing arrows into a target on the ground.

"In the old days our warriors fought with bow and arrow," the Mir told us. "Many Hunza families have bows of horn and rawhide which are hundreds of years old."

The next day was devoted to dancing. In the morning old men performed ceremonial figures, tripping lightly to the tune of pipe and drum. One red-bearded gentleman, who told us he was 98, did a gay number which resembled a sailor's hornpipe.

Sword dancing was the afternoon attraction. Dressed in brilliant Chinese silk robes, the Hunakuts paired off, carrying leather shields and curved swords, and filled the air with flashing steel (pages 502-503). The entertainment ended with half a dozen of the Mir's nine children, wearing grotesque masks, performing a devil dance.

The next morning the Mir called us out on his balcony. There he presented Jean with a bolt of soft, white Hunza wool. For me there was a Hunza robe of ibex wool.

"We get about 20 pounds of ibex wool yearly," the Mir said. "I have one robe made each year. I'd like you to take this one as a remembrance of your visit. But you must never wash it. Just throw a handful of moist sand on it, beat it lightly with a switch, and it will come clean immediately."

I donned the robe, and the Mir and Ayash walked with us to our horses. We rode off, and they waved until we were out of sight.

That afternoon as we crossed a particularly narrow bit of trail, I heard a sudden rumble. The next moment a rock crashed against my shoulder, and a shower of dirt and stones followed it down the mountainside. I shouted for the others to halt and kicked my horse furiously ahead. The trail shook beneath



519

This High Road from Hanza Nearly Cost the Authors Their Lives

When the author and his wife were on the high road from Hanza to the north, they were nearly killed by an avalanche.

It then tumbled away from the mountain side, the mountain.

I then from the saddle and my horse forward through the rushing debris. We stopped at a rock, and the snow and ice not five feet from us, erasing the trail.

A minute later, when it stopped, there was a 15 foot gap where the trail was—and where I had been. Lean and our packers were on the other side, and we were not there when the avalanche had passed.

It took two hours to get our horses and pack across the broken ground. We were still

when the avalanche plunged hundreds of feet down the mountain.

I then sat still and waited. I was not hurt, but the horse was killed and the pack was lost. The avalanche was a great disaster.

Soon I heard the packmen were on their way. As we said goodbye to Mirzah, he said I cautioned Mirzah to be careful of the broken trail on his return. He looked

"No worry," he said. "Mirzah on horse and pack will be careful of the trail. The pack will be careful. Horse have brain. This is a great disaster. It could have meant either jump or driver—no more at all."

Shetland and Orkney, Britain's Far North

Change Comes Slowly to These Outpost Isles Where Viking Ways Survive and Nearly Scottish Still Seems a Bit Foreign

By ISOBEL WYLLIE HUTCHISON

ON ORKNEY and Shetland an Olden is wedded to the sea. From almost every habitation in these breezy outposts of Britain the restless North Atlantic is visible. Some islanders never get beyond its reach—or want to.

"I wouldn't like to live shut in with trees and hills," an Orkney woman told me in the accents of her island. "I chust couldn't live where I couldn't see da sea."

The marriage is a stormy one. Gales periodically lash the islands and whip the encircling waters into a frenzy. Breakers, striking rocky shores, rise in foam hundreds of feet; spray covers the islands, shrouding every object. Air and water seem one.

When a Tempest Strikes

"We all had salt on our lips that day," said an island farmer, recalling the record-breaking storm of January 15, 1962. "Strangest of all was the sea. The wind leveled it flat as a table, but you couldn't see the shore for spray."

A lighthouse keeper's wife, who has listened to many a tempest, told me that on that night the triumphing wind struck a note she had never heard before—"a high-pitched scream that was terrifying."

But such outbursts are rare. When I reached the Shetlands it was a golden April day, and quite balmy. Though on the same latitude as northern Labrador, and as far north as you can go in Britain, both Shetland and Orkney for the most part have a mild climate. Warmed by the North Atlantic Current, they often enjoy milder winters than those in the interior of southern England.

A weekday air service whisks travelers from Edinburgh or Glasgow to Shetland in a few hours, but I had no desire to reach this old stamping ground of the Vikings in such unsuitable fashion. Like them, I went by sea. Boarding ship in Aberdeen harbor, I first glimpsed the gray old houses of Lerwick, Shetland's capital and largest town, through a porthole (map, page 522).

Lerwick dates from the 17th century and has been called Scotland's Venice. From the windows of its oldest hotel, built out into the water, you see waves lapping round walls founded below tidemark. At night you may be awakened by the sudden slap of water against stone as the tide swings. Gulls call all day around chimney pots, and a Shetland poet

greet the kittiwake in spring ecstatically:

*Peerie moultie! Peerie moultie!
O, du love, du joy, du beauty!
Wha's in da e me line? Wha's in da horn?
Wi' d' swither feet and d' whither een.**

I watched an islander feeding a voracious herring gull. The bird resented any interruption, angrily squawking for attention while its patron talked to me in the quick island accents that are so difficult for strangers.

The old Norse language is fossilized in hundreds of place names on the islands and was spoken there until about the end of the 18th century. Shetlanders still look on the Scottish mainland as a little foreign.

"No, I've never been to Scotland," a Scalbwy man told me, and an Orkney farmer boasted that during the war he had three sons serving overseas—one in Canada, one in Africa, and one in Aberdeen!

Base for Viking Sea Rovers

Lerwick is, in fact, almost equidistant between Bergen, Norway, and Aberdeen. Norse earls who ruled the Shetlands and Orkneys for three and a half centuries regarded their grassy holms (islets) and windswept, treeless pastures not as the outlandish fragments of a continent, but as centers from which they steered their galleys south to explore the northwest angle of Scotland, which is still called by the name they gave it, Sutherland or "South Land."

Earl Rognvald, who founded Kirkwall's noble Cathedral, still the glory of the Orkneys, thought it no rash venture to set sail for Spain, Jerusalem, and Constantinople. Today the islanders, direct descendants of those first mariners, are among the most conservative of Scots. Their blood, however, is mixed with that of the Lowland Scots, many of whom crossed the Pentland Firth long before the islands were joined in 1472 to the Scottish Crown by the marriage of James III to Princess Margaret of Denmark.

The Princess' dowry of "60,000 florins of the Rhine" not being all forthcoming, the Crown lands in Orkney were pledged for the remainder in 1468 and those of Shetland the following year. They were never redeemed and are today as much a part of Britain as the rest of Scotland.

Lerwick was once the "Herringopolis" of

*peerie moultie—little gull

swither—splashing; een—eyes



Scotland, employing 21,000 persons during the herring season in one record year.

"I mind when I was a boy," said an old sailor, "da boats were so thick in the Sound you could very near wauk on dem right across to Bressay yaander," and he waved towards the green island which shelters Lerwick harbor. "They came from aul over—Germany, Russia, Holland, France. But there's nothing at that now," he added sadly.

Herring steam drifters which ousted the sailing boats are now being ousted in turn by diesel vessels. These are more economical to run and can be converted to seine-net "white" fishing—cod, ling, halibut, winter haddock, etc.—when the herring season is over. Lerwick is still, however, an important fishing center; its vessels hauled in nearly \$772,000 worth of fish in 1952.

Lerwick's narrow main street has no sidewalks; pedestrians must hop nimbly into doorways when vehicles come past some corners, but accidents, apparently, are few. On Saturday afternoons the street is thronged with shoppers hastening in and out of thriving stores, many of which were founded by canny Shetland merchants a century or more ago. Lerwick was a good place for shopping even in rationed days, as another local poet sings:

Da butcher meat is just a treat
Whatever sort ye're buyin'.
Et road or cheep or tender steak
Or saucermeat fir fryin'.
Da painted head his come has spread
Trow every social section.
And ah! Da painted! Black or white
Da've equally perfection!

Smuggling in Dark Passages

Lerwick merchants once were not above a bit of smuggling in the shelter of their "lod-berries"—small piers, usually with an underground passage to a store. These passages are no longer in use (page 330).

The ancient Tolbooth, or Town House, visited by Sir Walter Scott in 1814 when he was gathering material for his novel *The Pirate*, survives as a mission to seamen. In its lower story were housed prisoners, "who would now and then come out for a breath of fresh air and a 'drop o' whisky," and at the request of the constable would peaceably go back again!

The Shetlander is an individualist, and Ler-

← Lerwick's Screaming Gulls Dive-bomb the Harbor for Fish Scraps

Time was when 2,000 wind-burners made Bressay Sound a forest of nests—"you could very near wauk across on dem." These herring steam drifters, which ousted the sailing vessels, are giving way in turn to diesel craft.

(Continued from page 519)

wick's 3,500 people may choose from a dozen different places of worship. Steep lanes lead up from Commercial Street in the old quarter to the New Town.

Though Shetland's soil lacks the fertility of Orkney's, it is rich in peat (page 532). The pleasant creek greeted us on the bare road for miles when we drove across the tundra to visit the old Norse capital of Scalloway (page 529).

This was a base for Free Norwegian activity during World War II. From Scalloway ran the wartime "Shetland bus," small boats which carried secret agents to Norway on many a daring operation and brought back refugees. It even stirred echoes in distant Florida. At Mr. Churchill's request, three U. S. submarine chasers were detached from their base at Miami and shipped to the Clyde, to be manned by Norwegian crews for this dangerous run. Shetlanders marveled at their central heating, showers, drinking fountains, and other crew comforts.

We found the little port strangely quiet. A few defiants sheltered at Prince Olaf Slipway, for an icy gale which almost snatched our breath away was roaring over the town.

Ponies, Shetland's Famous Export

But Shetland ponies at near-by Berry were grazing placidly. Apparently a 60-mile-an-hour gale is nothing to these hardy animals, for they remain outdoors all year round.

The origin of these small ponies is still obscure. Some say they were in the islands in the late Bronze Age; others, that they came from Siberia by way of Norway in the 11th century.

The "sheltie" combines great strength with its small stature. Andrew Thomas Cluness, a Shetland authority, tells in his recent book, *The Shetland Isles*, of an American sports promoter who issued an open challenge: his Clydesdale and Flemish draft horses would meet all comers in tests of strength, in heats proportional to their weights.

The challenge was accepted by a man who kept his entry dark. At the last moment he entered the arena followed by what looked like a huge dog. But it turned out to be a Shetland pony, and with it he won the contest easily.

The Shetland pony was the first pony to have its own stud book. Surefooted, intelligent, and easily handled, it is a most suitable first mount for a child (page 526).

In recent years the Shetland pony's popularity has reached an all-time high, especially in the United States, where sales attract dealers from all 48 States and Canada. Ridding is brisk, and purchased stock brings fancy prices. At a Missouri sale last May, King's XX, a champion harness pony, brought \$4,000 and the top mare \$1,525.

More than 2,000 breeding farms from coast to coast in the United States are able to meet the demand for the ponies. The number of purebred Shetland offspring registered in 1952 made a record, climbing to fifth place among the Nation's equine breeds. Registrations for 1953 are even higher.

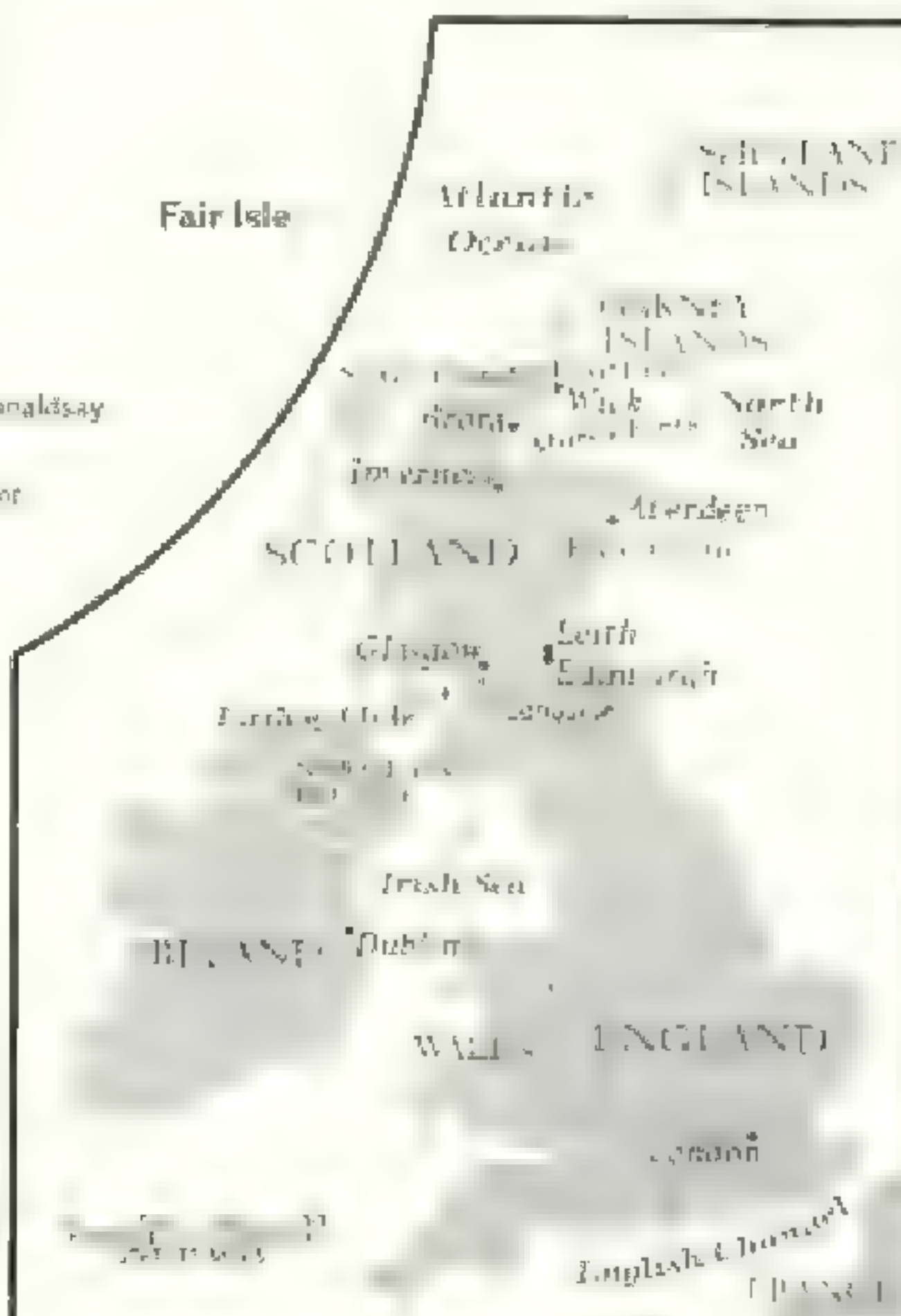
Near Lervik I talked with a pony dealer and asked why the Shetland breed is so small.

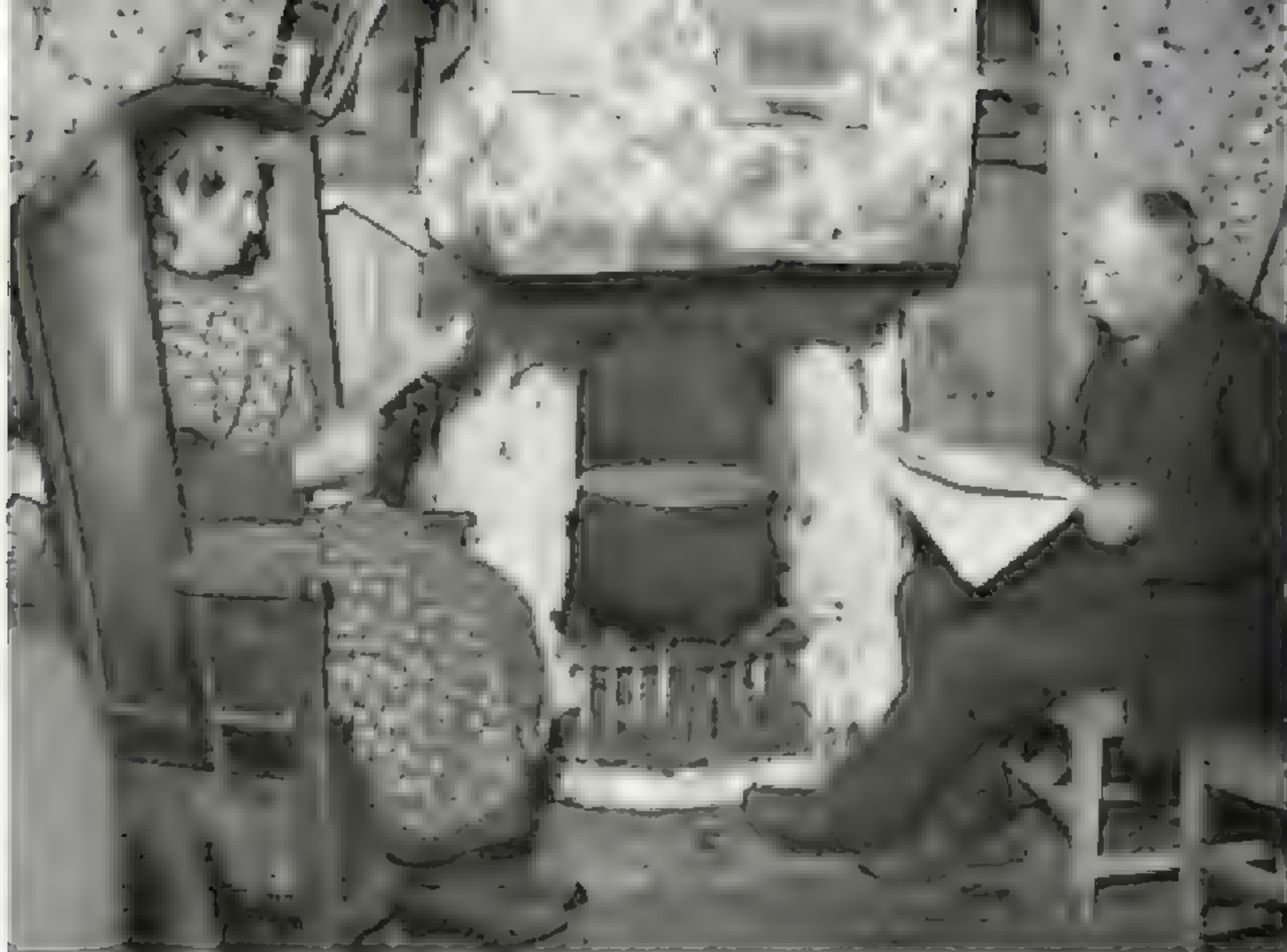
'Centuries of light feeding and poor pasture,' he said. 'Take them south and feed them up and they may be as big as others of their kind in a few generations.'

"Our planes are getting air minded," he added with a grin. "The last consignment for the United States left by plane a long ago, and last year some American officers who took part in Combined Operations over here flew parades back home with them."

The Shetland Islands also produce small sheep, which are gray, black, black and white, and "moorit" (mild chocolate brown). The latter are almost the same shade as the peat logs among which they wander, and it may be Nature's protective coloration.

Like tar ponies, Shetland sheep remain outdoors all winter. They eat heather tops and may be seen on the shores foraging for seaweed. Hard living conditions give them fine wool; so sensitive is the





Her Chin's Catharine Hood Protects the Lady of the House from Drifts

For many years the people of the North have been a people of the North. They have been a people of the North, and they have been a people of the North.

The North has been a land of the North, and the North has been a land of the North. The North has been a land of the North, and the North has been a land of the North.

There are many things that are different from the North and the South. The North and the South are different.

The North is a land of the North, and the North is a land of the North. The North is a land of the North, and the North is a land of the North.

The North is a land of the North, and the North is a land of the North. The North is a land of the North, and the North is a land of the North.

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There are many things that are different from the North and the South. The North and the South are different.

The North is a land of the North, and the North is a land of the North. The North is a land of the North, and the North is a land of the North.

"The Edge of the World"

The North is a land of the North, and the North is a land of the North. The North is a land of the North, and the North is a land of the North.

The North is a land of the North, and the North is a land of the North. The North is a land of the North, and the North is a land of the North.

The North is a land of the North, and the North is a land of the North. The North is a land of the North, and the North is a land of the North.

from the North Sea into the Atlantic, or vice versa.

Shetland's larger islands lie together so compactly that a daily bus-and-ferry service from Lerwick links Mainland to Yell and Unst. The North Isles are also reached by the mailboat *Earl of Zetland*; on this boat during meat-scarce 1946 I was startled to find a nut-brown chop on my breakfast plate.

My sister and I traveled to Unst by the overland route, a 5-hour journey. The road winds over rolling moorland, into which long, narrow voes, or hays, penetrate for miles. The craft houses we passed here and there were mostly a modern type, wood, brick, and concrete having largely replaced the older thatched dwellings of stone.

Peat stacks stand by the doors, and sheep and ponies graze on the heather. Piped water and electricity are now being introduced into outlying districts of Orkney and Shetland, but many crofters already make electricity by small wind-driven generators.

Going to Yell

At Mussbank we boarded a ferry for a quick trip across the sound to Yell, a large island where many ponies are reared. Here another bus was waiting for the run to Mid Yell, where passengers for Unst transferred again.

Yell is the largest island in Britain still without a pier," said a passenger, "but they're building one at last at Mid Yell that will take the *Earl*—and high time, too."

Shetland's Norse place names sound strange to visitors. *Yell*, or *Jala*, comes from the same word root as Denmark's famous Jelling.

"Did you ever hear," asked my companion, "of the three ministers in a Shetland bus? One was going to Yell, another to Brue, and the third to Houll!"

We topped a rise and saw a strip of brilliant turquoise backing purple peat bogs. It was the well-named Bluecull Sound, through which the tide runs strong and raises walls of water even on a calm day as North Sea and Atlantic Ocean wrestle for mastery round the Shetlands. We crossed it in another mud boat and were in Unst, Britain's northernmost island. There was no sizable land now between us and the polar ice floes.

The small island is of special interest to geologists for an outcrop of serpentine. Iron ore is still mined at Haroldswick. Natureists delight in the bird sanctuary at Herma Ness, and botanists in the "rare and curious plants" recorded by an early writer.

The first *Flora of Shetland*, published in 1845, was the work of a young Unst botanist, Thomas Edmundston. His discovery, near Baltasound, of a sandwort new to Britain (*Arctostaphylos alpina* var. *norvegica*) at the age of

11 attracted the attention of Robert Graham and Sir William Jackson Hooker.

Lady Franklin visited Unst, seeking news of her husband's ill-fated Arctic expedition of 1845. Sir John's last port of call had been at Stromness in the Orkneys. Lady Franklin, however, was disappointed to find that the ship had not yet returned from the Arctic. She was the first woman to visit the northern seas.

We spent a week in a little cottage at Uyeasound in the south of Unst. Our hostess, who had just celebrated her golden wedding, looked after an invalid husband, her house, visitors, animals, and garden and cooked, cleaned, and washed. She still had to carry all the water for the house in pails from a neighbor's, for the piped supply had not yet reached her. The soft light of oil lamps still lighted the cottage.

A traveling cinema visits the village once a fortnight, but our hostess has no time for such diversions. She showed us her own and her granddaughter's handiwork of long, dark winter evenings—gloves and scarves of bright shade and intricate pattern.

Almost all Shetland women add to the family income by knitting, and Unst is famous for its "lace knitters," who work the finest wool. For "lacework" the wool is carded and spun by hand, though spinning wheels and spinners are rare now even in this last outpost of Unst (pages 534, 535).

All other Shetland knitwear is of a heavier type, and the wool is sent to be machine-spun at Inverness, mostly, or at Broom.

The story that Spanish sailors wrecked from the Armada taught Shetland's inhabitants the bright shades and geometric patterns of their "hosiery" may be set aside. One supposition is that the patterns came from the Orient through Scandinavia.

Tale of a Frustrated Mariner

Life at Uyeasound is by no means dull. All year unexpected visitors come to the cottage, for there is no inn in the little hamlet.

Some summers past one visitor was the harbormaster from Torsbavn in the distant Faeroes. He had set out in an open boat on a summer evening to sail to Denmark—just like that! A storm nearly swamped him, but he was rescued by Shetland fishermen and arrived in Uyeasound "drying his strange line and wad his face and crusts with salt!"

This daring voyager set out again for Copenhagen, but again he was baffled by weather and did not return. The next summer, which landed him at his destination, he still corresponds with his friends of Uyeasound.

Wartime brought less desirable visitors. While our landlady was milking on a quiet



Children's Sheep and Poultry Self-Reading Islands

For years the children of the islands have been reading the sheep and poultry books in the islands. The children of the islands have been reading the sheep and poultry books in the islands. The children of the islands have been reading the sheep and poultry books in the islands.

Sy. eschsch., *Eschscholzia* (see *Eschscholzia*)



Norwegian Commandos Based on Scalloway Raided Their Occupied Homeland

32 Norwegian commandos based on Scalloway, on the Orkney Islands, raided their occupied homeland on the night of May 26-27, 1945. The commandos, who had been in the Orkney Islands since the end of the war, had been ordered to raid the Norwegian coast and to destroy the German commandos who had been based there since the end of the war.

The commandos landed in a sandy cove on the Orkney Islands. A motorboat suddenly appeared and began to circle around the headland on one of the Orkney Islands. The commandos then moved to the shore. There is no easy job, for the tower is 230 feet above the surface, and the swell is constant.

On my visit to the Orkney Islands in 1946 I had found the keepers at Barra Firth setting out in a motorboat and had joined their party. For miles we sailed sheltered waters between Barra Ness and Sava Vord; their towering lighthouse was Britain's finest rock scenery. The lighthouse was built by sea birds frequent their vast tower.

Leaving the shelter of Barra Firth, we landed at the lighthouse and climbed to the high tower. Up to 1945 the tower was built by sea birds. In 1845 carried to the lighthouse by sea birds to build the original tower. They

built it in the record time of 26 days. Shetland's first lighthouse, at Sumburgh Head, was built in 1791.

In the old lighthouse, built in the 18th century, the lighthouse keeper, Robert Louis Stevenson, was the son of his father, Thomas, who was a lighthouse keeper. In World War II German bombers passed the lighthouse, but they did not land.

We were joined by a useful landlady, for the lighthouse keeper, who showed us literally round his circular lighthouse.

On our return journey we circled the lighthouse, but, unlike Lady Franklin, did not land on it, though it was not uninhabited. On this uttermost tip of the Orkney Islands, quite uninhabited by our neighbors.

Come are the days when Shetland clerics



A Shetland Girl Bottle-feeds Her Lambs

When the Shetland sheep are born, the mother is often unable to suckle them. When this happens, the lambs are bottle-fed by the mother.

After the General Assembly of their church in Edinburgh took a fishing vessel to Holland, crossed to London, and then went north.

The first scheduled air-mail service was inaugurated between Inverness and Orkney in 1934, and the first regular air mail to Shetland in 1937.

Shetland's small airport is at its southern tip under Sandburgh Head. Near it is a famous prehistoric village of the Bronze Age or earlier, surrounded by the ruins of a 10th-century castle which Sir Walter Scott christened Jarlshof. The name stuck to it, and so to the ruins underneath.

A fine road links Sandburgh airport to Lerwick, 25 miles north. On their way to catch a plane, travelers get a glimpse of Shetland's pre-historical curiosity, the Broch of Mousa, on a small island off Sandwick.

These circular, unadorned towers called broch are unknown outside Scotland. They

were probably built for defense or refuge against the Norsemen by the Picts.

Numerous brochs have been discovered, but Mousa is the most complete, since it is structurally complete. Due to its remote location, it has survived to a height of 15 feet and is perfectly preserved. It is believed that the broch was built and sheltered a runway coming from Norway, and that another pair of towers were besieged in it 250 years later by the lady's son.

The main airfield is on the island, and hills surround the crowded plane landing outward for Kirkwall in the Orkneys. In 20 minutes we passed over Fair Isle with its cliffs and grain fields, the last in the islands to be plowed by man.

Like Helgoland, Fair Isle is a noted bird observatory. A banding station has been installed by its owner, Mr. George Waterston, for the study of its migrants.

Soon we were over the Orkneys, now living North Sea. The first North Sea island is a well-known island with its fields. The island has its own breed of small sheep, and, like the Shetland sheep, can thrive in seawater.

To Kirkwall in the Orkneys

Westray, Eday, Stronsay were seen as we approached, a glittering spectacle with their white sands, emerald pastures, and brown hills where, small as toys, farmers were at work with tractors. Here the Ice Age was a more generous godmother than in Shetland, lulling over the island with rich talenore on beds from the bottom of the sea. The Orkney Islands are large islands, but the Orkney Islands are small islands. Orkney has become a great island for the Orkney Islands.

Like strips of gummed paper, white rock is the islands and little farmhouses stand on the hills, like stranded gulls. Over Kirkwall I looked down on a throng of gray houses, a side of the water, with the steep roofs of the



Stacked Peat Dries in an Orkney Yard. In Winter It Moves Indoors to Heat the Cottage

Maeshowe, a prehistoric chambered tomb on the Orkney Islands, is a fine example of the Neolithic period. It is a large, circular structure made of stone, with a low entrance. The interior is decorated with carvings of animals and other figures. It is believed to be a place of burial or a place of worship.

A day's outworking can cover the 10,000-acre main island, which is only 25 miles long.

"I'll show you a contrast to Herschel," said Mr. Sinclair when he took us to visit western Mainland.

Orkney's Mainland is an island of contrast. From the Stone Age village of Skara Brae, three or four thousand years old, we passed under the gleaming pylons of the Hydro-Electric Board's experimental wind generator on Costa Head—the biggest in Britain. I was told where tests of wind power and appropriate machinery are being made.

We passed another monument again where we found the remains of the Stones of Stenness, an ancient monument of an unknown part of the prehistoric period. Near by is another megalithic monument, the Ring of Brogar, where 27 out of some 60 megaliths still stand, one more than twice the height of a tall man. They have stood there probably since the early Bronze Age. Even World War II did not disturb them, though some were damaged. In March, 1940, German bombers dropped the first of their grim letters on British civilians at the hamlet of Budge on Waith.

Further along is the famous chambered

tomb of Maeshowe. A low tunnel gives a surprising entrance to a large chamber with vaulted roof. The flickering candles which had lighted it when I first saw it in 1946 had a new place to electricity. The chamber seemed now suited to its mystery.

Plundered by 12th-century Norsemen

Maeshowe has attracted warriors of every age. Norsemen in search of buried treasure plundered it in the 12th century and carved their names and those of their women in runes on its walls.

Ingjether is the farthest woman. Her mound of the hard ax is carved in the stones.

More recently, a daring RAF pilot spent the night in a small stone chamber off the central hall. He was untroubled by breaths of Ingjether, Hermodr, or other ladies for people say the ancient never left at all.

Kirkwall, Orkney, is a fine example of a town of lochs and charms. The 18th-century houses that once shouldered its narrow causeways are giving way to the charmless building found in mainland suburbs (page 531).

Formerly, the town was a small town. Kirkwall's growing glory, the Cathedral dedicated to St. Magnus in 1137, set in a tree-fringe



With Her Sheep Dog For Company. Grandmother Closes Wood House & Sells and Flights
 Home. Father's Death. Mother's Death. Grandmother's Death. Grandmother's Death. Grandmother's Death.

and the... it is a... of the... of Earl Patrick's... the much ablet...

In later years, when certain "secret" tests were found in homes and villages of the city, they are known to be in the house of St. Joseph's Hospital, in the Cathedral and of St. Michael's, which was destroyed in 1946. In the middle of the city, by the river and the city hall, there is a small building.

[illegible]

It is not only the

villages of the main island but to some of the
 outer islands as well.

When the spring in the ground was hit, the water came bubbling up and continued to rise until it poured out the bottom of the hole. Mr. Conhill started looking for a pump and began to take a look at filling up with large concrete blocks, the east end of the row where sixteen blackships had failed to enter. The boat has altered the gangway of South Pierway at Harwich and is now the only one of the new wharves now market by car hire.

Chosen India by Princes

[illegible]

A hand-written copy of from [redacted] reports
the story from the rest of the [redacted]

Buses took us on to South Ronaldseny's picturesque village on St. Margaret's Hope. The town was once famous for its paper mills.



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1910

Larwick's Characteristic Houses Wet Their Feet in Bressay Sound

From a row of houses on the shore of Bressay Sound, Larwick, Orkney, looking out over the water towards the mainland.

Norfolk Square, with a white building, was the residence of the Larwick family, one of whose members, being the son of a minister in the 17th century, Robert Burns' father was a kinsman of the poet himself. Burns' father was a kinsman of the poet himself. Burns' father was a kinsman of the poet himself.

Last of Orkney's Great Anks

We sailed between the striking red and white headlands of Eday and Galf of Eday and waited on the small island at Papa Westray, which has no pier, for the boat to come up. The day was sunny and the sea was calm. The great anks of the island were visible in the distance.

Opposite Papa Westray lies the larger island of Westray. A fleet of its village, *Port Sæund* tied up for the week end, and I found myself in the middle of the island.

A good deal of the work of the island is done by the women of the island. The women of the island are the best of the island. The women of the island are the best of the island.

of the island. The women of the island are the best of the island. The women of the island are the best of the island.

The Na Naup Head Lighthouse at Westray is extremely fine. It is a fine example of the western approach to the lighthouse, which Paul Kitchener of Skipton and the son of the architect *Robert Kitchener* built.

There are two islands in the Orkney which have two islands. The future seems to be a very bright one. The future seems to be a very bright one. The future seems to be a very bright one.

When I was in the Orkney Islands, I heard, as someone has remarked, that "the Orkney will not be so trusted that there will be a comeback to 1845, when there was so much that one man, classified as a 'lack of all trades,' was reported as 'the kirk officer who served the parish in the different capacities of a minister, schoolmaster, slater, cooper, and boatman, and a good many other things.'"

By ADMIRAL ARTHUR W. RADFORD, United States Navy

With Illustrations by National Geographic Photographers and a Map

ASIA'S great importance lies in the single overwhelming fact that more than half the world lives there.

Add to this the military commitments of our mutual-assistance pacts, involving millions of people on the periphery of Asia, and you can understand why our battleships are deployed from the Sea of Japan to the South China Sea.

The white hats that bob along Tokyo's Broadway—the Ginza—and on Hong Kong's Gloucester Road are out there on Navy business, protecting the security of American interests in a score of widely scattered Asian places with names unknown to most of us a decade ago. (See the National Geographic Society's new map, "China Coast and Korea," a supplement to this issue.)

Our Far-flung Interests

American contact with the Far East began with the opening of our trade there immediately after the American Revolution. Our interests were compounded when Commodore Perry opened Japan to the West 100 years ago and amplified half a century later when Admiral Dewey steamed into Manila Bay.*

Since the signing of the Japanese surrender on the Missouri, our Asian responsibilities have been rendered infinitely more complex. The support of South Korea, Japan, Okinawa, Formosa, the Philippines, and other important free countries on the fringes of Asia indirectly concerns the protection of an area and a population far larger than our own.

Only a nation with a powerful navy could undertake such an enormous task five to eight thousand miles from its homeland.

Involved is more than the limited naval role of keeping the sea lanes open and supplying our troops. The blockade of North Korea, the patrol of a thousand miles of the China Coast, and the active participation of fast carrier task forces and the Fleet Marines in the Korean struggle have added up to no small task. Yet these have been only a part of Pacific Command responsibility.

To picture the disposition of our Navy in the Far East, think of a giant hand articulated by a wrist that is Hawaii, headquarters of the Commander in Chief, Pacific Fleet. From Pearl Harbor fingers of operations, supply, and administration extend in several spheres of naval activity.

Chief among these is the Naval Forces, Far East, which includes the Seventh Fleet and the First Fleet in Japan.

Second is the Big Marines Command, op-

erated from Guam, the westernmost segment of United States sovereignty in the Pacific.

At Sangley Point, on the calm waters of Manila Bay, is the Commander of Naval Forces, Philippines, who keeps a concerned eye on troubled Southeast Asia while directing activities at the naval base on Subic Bay.

The remaining forces are the lesser installations on Formosa and Okinawa, where the routine patrols of the International waters off the China Coast are launched (page 562). These are administered from Hawaii, but in the case of Okinawa through Japan.

United States Naval Forces, Far East, is under the command of Vice Adm. Robert P. Briscoe, and its operations are directed from his headquarters at Yokosuka. Also from there, as a part of the unified command, he directs the strategy of the Seventh Fleet, and at the request of the Japanese assists in building their defense forces.

On a recent visit to Yokosuka I observed a squadron of American-made frigates flying the Japanese flag. I recalled that only eight years ago I had commanded a naval task force bent on the destruction of the Japanese fleet. Now, here were ships we had given them for patrol and harbor defense. Moreover, Japanese crews are being trained by Americans to handle the vessels.

Yokosuka, only an hour and a half by rail south of Tokyo, was Japan's largest naval base. It serves now as our Far East naval headquarters and a rest area for crews on

The Author

Admiral Arthur W. Radford, United States Navy, knows the turbulent Far East as the average householder knows his own back yard. Because of this practical knowledge and his keen grasp of global strategy, he was named by President Eisenhower to serve in the Nation's highest military post—Chairman of the Joint Chiefs of Staff. The accompanying article sums up the author's impressions formed during a four-year tour of duty as Commander in Chief of the Pacific Fleet. It was written before his promotion.

As CINCPAC, Admiral Radford traveled more than 500,000 miles from his Pearl Harbor headquarters to visit every corner of a command stretching from Korea to Indonesia. On his official journeys he often conferred with such leaders as President Rhee of Korea, Premier U Nu of Burma, and Generalissimo Chiang Kai shek of the Chinese Nationalist forces on Formosa.

Admiral Radford during World War II commanded a carrier group. His performances in the Baker, Maui, and Tarawa landings won him the Distinguished Service Medal. He has long been an outspoken advocate of air power.—E. H. R.

* See "The Yankee Sailor Who Opened Japan," by Ferdinand Kuhn, National Geographic Magazine, July, 1953.



U. S. Navy Ships off Korea's Battled Coast Draw Sustenance from a Moving Oiler

Seventh Fleet ships, including a towed supply ship in the Sea of Japan replenish food, fuel, and ammunition. Long fuel line passes from the oiler to the smaller ship, which in turn passes it to the transport.



Wings Folded—Combat Planes Crowd *Princeton's* Deck Like Butterflies at a Water Hole

Rescuees are crowded onto the ship's deck—Landing is in progress. Destroyer working its way out of port serves as the point of ease a man falls overboard during the operation.

rotation from weeks at sea. Its dry docks, bigger than Singapore's, can accept any vessel in our fleet. This 500-acre peninsula, cut off from the mainland by bays, has seen as many as 50 United States ships under repair or overhaul at one time.

The same civilian workers—some 15,000 of them in Yokosuka—who run lathes and pounded rivets for the Japanese Navy have proved willing hands in repairing American ships. And the base's machine shops, 1,000-bed hospital, and housing facilities (7,000 Americans live there) were adapted with amazing ease to our requirements.

All this constitutes an appreciable contribution to the Japanese economy. American spending is the difference between Japan's survival and bankruptcy.

Add to this the 20 million South Koreans, and there are almost as many people in the Orient directly dependent on our economy as there are Americans here at home. And to complicate tomorrow's economy, the United Nations will soon be faced with the problem of rehabilitation in Korea.*

Liberty in Yokosuka

Norfolk, Long Beach, and Honolulu have reeled under the impact of large liberty parties from the fleet. But they have never seen anything like the 25,000 sailors, many fresh from patrols and the "bomb line" off Korea, who have descended on little Yokosuka from noon until midnight.

Liberty parties center on the Enlisted Men's Club, where 27,000 sailors have been entertained in a single day. Free movies run continuously in its huge theater, while boxers spar and weight-lifters grunt in its gymnasium.

"The men try to squeeze 48 hours into 12," says the club's manager.

Yokosuka businessmen have been quick to adjust to the recreational role. The town's few recreation spots of 1946 have blossomed into a neon-lighted strip a mile long and three blocks wide. Street signs are in English, and the loudspeakers so beloved by Japanese merchants bellow Stateside phrases. Sailors' dollars, converted to yen to avoid black-market problems, are trapped by a multitude of shops.

We get on fine with the Japanese there. Capt. Joseph P. Thew, American commander of the base, is a member of the local Chamber of Commerce and of Rotary. Our personnel cooperate with the Japanese in many matters, even in teaching local police how to handle pistols in exchange for judo lessons.

"When I had a party for the mayor and 250 other people," Captain Thew told me, "he played the piano and the rest drank Coors and ignored the tea!"

Not all Navy life in Yokosuka is lived to music. Many men stationed there waited long months for American housing. They finally paid exorbitant rents so families could join them in substandard Japanese houses among the mustard and peach blossoms of the surrounding hills, or on the graceful crescent beach of near-by Hayama, where the Emperor has a summer home.

But the Navy in the Far East is much more than foreign place names, titles, and chains of command. The Navy is Americans trying to adjust the ways of Peoria and Phoenix to life at sea or in sandbagged bunkers ashore.

The Navy is a sailor relaxing at the soda fountain on a large combat ship, and it is 600 movie screens all over the vast Pacific served with the latest films. It is weary eyes watering after hours of scanning a radarscope, and numbed blue hands exploring a fouled propeller in freezing waters.

The Navy is a Marine helicopter landing at night in a pitch-black ravine to evacuate a coughing, bewildered boy with shrapnel in his chest. Always it is dedication to the eternal vigilance necessary to maintain American security in far places.

In rear areas the Navy is wives and families, too—schools on Guam, harassed mothers in isolated areas teaching Calvert home-study courses, a ship's store on Formosa with shopping carts made of bamboo, and a Navy wife on Okinawa who turns a metal Quonset hut into a homelike model apartment (page 375).

Flying the "Codfish Line"

Inland from Yokosuka lies Atsugi Naval Air Station where planes are readied for combat. A four-hour flight from Atsugi on the "Codfish Line" will deliver you over the Seventh Fleet wherever it may be cruising in the Sea of Japan.

Landing directly on a carrier's flight deck, Codfish is the most unusual airline since the Army, Navy, and Marines operated SCAT from New Caledonia to Guadalcanal in the early, catch-as-catch-can days of World War II. Its name comes from the term "Carrier on Deck Delivery," or COD, and the line operates with no more amenities than the name suggests.

Flying converted Avengers anywhere, anytime, COD pilots make passengers wear rubber survival suits and offer facetious apologies for the lack of comely stewardesses and chewing gum. Organized in April, 1951, COD has carried thousands of passengers to and from the fleet. Most were specialists,

(Text continued on page 347)

* See "The GI and the Kids of Korea," by Robert H. Mosier, NATIONAL GEOGRAPHIC MAGAZINE, May, 1952.



★ Admiral Radford, on Lincolnton Tour, Visits Pacific Fleet Leaders

Admiral Radford, on Lincolnton tour, visited the other fleet leaders, including the fleet commander, Admiral Nimitz, and the fleet vice commander, Admiral Halsey. The admiral also met with the fleet staff and the fleet operations center. The admiral's visit was part of a tour of the fleet's operations and command structure.

✧ Marine Flyers in Mae Wats Report on the Results of a Strike

Marine flyers in Mae Wats reported the results of a strike. The strike was successful, and the flyers reported that they had achieved their objectives. The strike was a significant event in the fleet's operations, and the flyers' report provided valuable information to the fleet command.







Aerial Breeze, Swing Aboard the Carrier *Oregon* Replenishing at Sea

This is a reproduction of the original photograph, which was taken by the U.S. Navy, and is in the public domain. It is a black and white photograph, and is a reproduction of the original photograph, which was taken by the U.S. Navy, and is in the public domain.



Cassidy's Crapin' Hangar Bay Frames the Ammunition Ship USS Baker

I want each participant to be able to make a list of changes. I will be doing this myself and want to make sure I am not overlooking anything. I will be doing this myself and want to make sure I am not overlooking anything.



Perched on an Elevator over the Water, a Panther Rises Swiftly to the Flight Deck

The Panther, a large, dark, angular structure, is being hoisted by a crane. The structure features a large white star on its side and the word "NAVY" in bold, white letters. The background shows a ship's deck with various structures and equipment. The image is oriented vertically on the page.

visiting staff officers, or men on sick and emergency leave.

Only a part of the naval power available to us has been employed in the Korean War. Using the ships and men necessary to keep the fleet in balance with our air and ground effort, we still have had much in reserve. This has permitted rotation of active vessels in the Pacific through Admiral Briscoe's command, together with many ships from the Atlantic and the Mediterranean. In addition to harm done the enemy, the operational training has been invaluable.

Korea's geography was tailor-made for fast carrier strikes. Carrier planes could range the whole peninsula. But because the industrial northeast of the country was far from South Korea's airfields yet within easy reach of naval air, its destruction became the primary task force target.

Highways and rail lines forming a V north from Wonsan toward Mien (Shenyang) and Vladivostok have been among the chief Communist supply routes. The success of the carriers' work has been shown by the destruction of all major targets along both sides of this V within Korea. In fact, the job was so well done that for the past year nearly half the carrier sorties have been diverted to close air support of our ground forces.

This may make the campaign seem too successful. Actually, while all profitable targets have been destroyed and leveled again when rebuilt, Communist supplies continued to move south. Most have come after dark by oxcart, and when they arrived the driver shouldered his gun and became a replacement, while the ox found its way into his rations. Enemy supplies have been packed in small bundles, lashed to A-shaped wooden frames, and strapped to the backs of thousands of coolies, who trudged down the mountain passes under darkness.

Naval Air Supported Ground Forces

So, at the request of the ground forces naval air shifted its emphasis to bombing supply and build-up areas directly behind the enemy lines.

"We let 'em carry all that stuff down by foot if they want to," one intelligence officer remarked, "then blow it up where it finally comes to rest, wearing 'em out in the process!"

Carrier air operations never fail to thrill even an old naval pilot.* There is the full-throated howl of the jets as they are jockeyed toward the catapults, followed by the scramble of the deck crew under the plane to set the bridle. Then the crew roils clear, like so many agile tumblers, as the craft hurtles down the track. Finally there is that moment, repeated every half minute, as a plane

scrambles forward into the wind, when everyone on the deck can see that they are to watch the wings bite air as they clear the bow (pages 553-559).

In war, when a carrier sends off its final strike before returning home, the ship has the feel of the last day of school. To heckle newcomers, departing crews paint planes with names like "Flak Bait" and "Fuel Hog."

On the last day of his tour as Commander of Task Force 77, Rear Adm. Robert T. Hickey, Jr., had a last flight on a plane crewed like to hit. With an eye to operational requirements, he used their suggestions to draw up a final mission chart which proved to be their most daring and productive assignment.

War Lessons Improve Carriers

Each new carrier, like Admiral Hickey's flagship, *Oriskany*, shows technical and operational improvements. A moving stairway carries cumbersome deck pilots from ready room to flight deck (page 555). An automatic helmsman does better, in rough seas, than a skilled quartermaster. Recalling damage to controls from Kamikaze hits, naval architects have fitted the 33,000-ton *Oriskany* to be steered from any of six locations—with a portable helm the size of an ashtray!

The scarcity of air opposition introduced some strange twists in the Korean war. Jets, for example, were no more effective in long-range bombing and close support work than the slower, piston-driven Skyraider of World War II with its bigger bomb load.

The speed of the Navy's Panthers fits them equally well for reconnaissance and aerial combat. In one incident, two Panthers from the *Oriskany* encountered a flight of seven MIG's over northeast Korea, not far southwest of Vladivostok. Both jets came home, after shooting down two MIG's and a probable.

On the other hand, the AD Skyraider, work-horse dive bomber of the fleet, has been most effective as a fighter against the slow, propeller-driven aircraft the Communists have used to heckle and harass our troops after dark.

But Task Force 77 is not just carriers. It is a fast, well-balanced force capable of a sustained speed of better than 30 knots; and it combines the defensive gun power of many anti-aircraft battalions with the high-flying offensive punch of its sleek fighters and bombers. Screened against submarine attack by divisions of shark-gray destroyers bristling with depth charges and "hedgehogs," and with at least one heavy support ship always in company, the force is the

* See "The Navy's Last Stand," [Aircraft Carrier] in *McCall's* 1961 Governor's Award for Literature, *McCall's*, July, 1962.



U.S. Air Museum Portrait War's Marine Dog Tags

A photograph of a man in a military uniform, kneeling and holding a small white dog, is featured in a museum exhibit. The exhibit is titled "U.S. Air Museum Portrait War's Marine Dog Tags." The photograph shows a man in a military uniform, including a garrison cap and a jacket with a fur collar, kneeling outdoors. He is smiling and holding a small, white, fluffy dog. The background is slightly blurred, showing what appears to be a fence or structure.

The photograph is part of a museum exhibit titled "U.S. Air Museum Portrait War's Marine Dog Tags." The exhibit is located at the U.S. Air Museum, which is a collection of aircraft and other military artifacts. The photograph shows a man in a military uniform, including a garrison cap and a jacket with a fur collar, kneeling outdoors. He is smiling and holding a small, white, fluffy dog.

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U.S. Air Museum
Portrait War's Marine Dog Tags
U.S. Air Museum

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hard-hitting spearhead of the Seventh Fleet.

In the course of the Korean war, thousands of men have been transferred between ships under way by a sort of breeches buoy, called a "highline," that swings its passenger across the intervening sea in a twirling, swinging cage. An amusement park operator would find this a thrilling substitute for the roller coaster.

With COD flights, helicopters, and highlines, there is no ship in the Seventh Fleet that can't be boarded at sea.

During visits to the fleet, I have called for a helicopter to move freely between ships as I would a taxi on land. Thus, in an hour I could move from a battleship to a carrier and on to a tender for inspection.

Helicopter and highline have made the fully equipped hospital of a battleship immediately available to an injured man on the smallest mine sweeper. They also bring the shorthanded commanding officer replacements when he needs them most.

For the Navy, Korea has borne many parallels to the British-French assault on the Dardanelles in World War I. There have been vast mine fields to sweep, concealed shore batteries to engage; and the Communists, copying and improving on the Turks at Gallipoli, have built coastal earthworks rather than old-style forts, knowing them to be poorer targets for an attacking fleet.

But amphibious operations have come a long way since World War I, and when we chose to invade the enemy's area through Inchon we overcame these obstacles without great difficulty.

Bombarding Enemy Shores

Surely the sensation on a battleship bombarding shore positions has not changed since World War I. Unlike smaller cruisers and destroyers, which are organized bedlam in combat, aboard a battleship the controlling impression is one of utter stillness, except for the occasional roar of the big guns and the louder, faster "slap, slap" of the 5-inchers.

Between salvoes there is no sound but the rush of the sea and the rattle and rattle of enemy fragments clanging along the tank and ricocheting off the armor. There is no movement on the usually active deck but the splatter of spray from the bow wave and the splash of probing enemy shells.

In the open sunlight of the bridge you think of the 3,000 men in the hull beneath you—men reading boiler pressures, twisting the dials of the complex fire-control system, feeding shells to guns, or electronically reading the surrounding skies. You think also of hospital corpsmen and bakers, damage-control parties and electricians waiting in dim

companionways, listening to the muffled thump of guns above and wondering whether enemy fire may bring a hit.

Unlike land operations, combat at sea is seldom sustained.

I accompanied Vice Adm. J. J. Clark, who has commanded the Seventh Fleet for the past year, into Wonsan harbor aboard a battleship scheduled to shell its defenses. His ships turned 45 guns on the enemy and fired nearly 200 tons of ammunition—more than was spent during many a history-making sea battle in the days of sail.

The talk in the admiral's mess that night, after discussion of the day's action—commonplace for destroyers, cruisers, and battleships of the Seventh Fleet—revolved about future task force operations and cooperation with the Fifth Air Force.

"The Fleet Goes Where We've Been!"

While we were slowly cruising in Wonsan harbor that day, firing "call missions" in response to requests from Allied-held islands near by, aptly named little ships like *Chatterer* and *Osprey* were performing the dangerous task of sweeping enemy mines. Fired on by Communist shore batteries almost every day, though seldom hit, dodging mines and sweeping mine fields, setting off heavy blasts with small-arms fire, the resolute crews of these venturesome ships have been heard to remark, "The fleet goes where we've been!"

In an assault landing, a sweep is led by a squadron of 40-foot MSB's (Mine Sweeping Boats) in echelon. The 10-man crews of these unarmored open craft performed with great gallantry in a feint landing at Kaio on Korea's east coast, where only enemy nerves were at stake. Nothing has alarmed the Communists more, or drawn more point-blank fire, than these purposeful MSB's.

Searching for floating mines hoisted in northern waters to drift south along Korea's coasts, AMS's (Auxiliary Motor Mine Sweepers) had to clear the way for the day bombardment of the coast by capital ships.

Mother ship of the AMS is the utilitarian LSD (Landing Ship, Dock), affectionately known as "dog boat." Originally designed to transport and repair landing craft, the LSD is built with gates astern that open on a cavernous built-in dry dock. This void, big as five basketball courts laid end to end, has met many uses. The LSD *Gannon Hall* (page 568), in her tours off Korea, has served variously as a compound for 4,000 prisoners of war and a camp for a regiment of Marines. The latter pitched their tents and built their campfires right on the well deck of their sea-going hospital.

Ships like the LSD are but one element in



A Navy's Long Rifles, Belching Flame, blast Enemy Targets

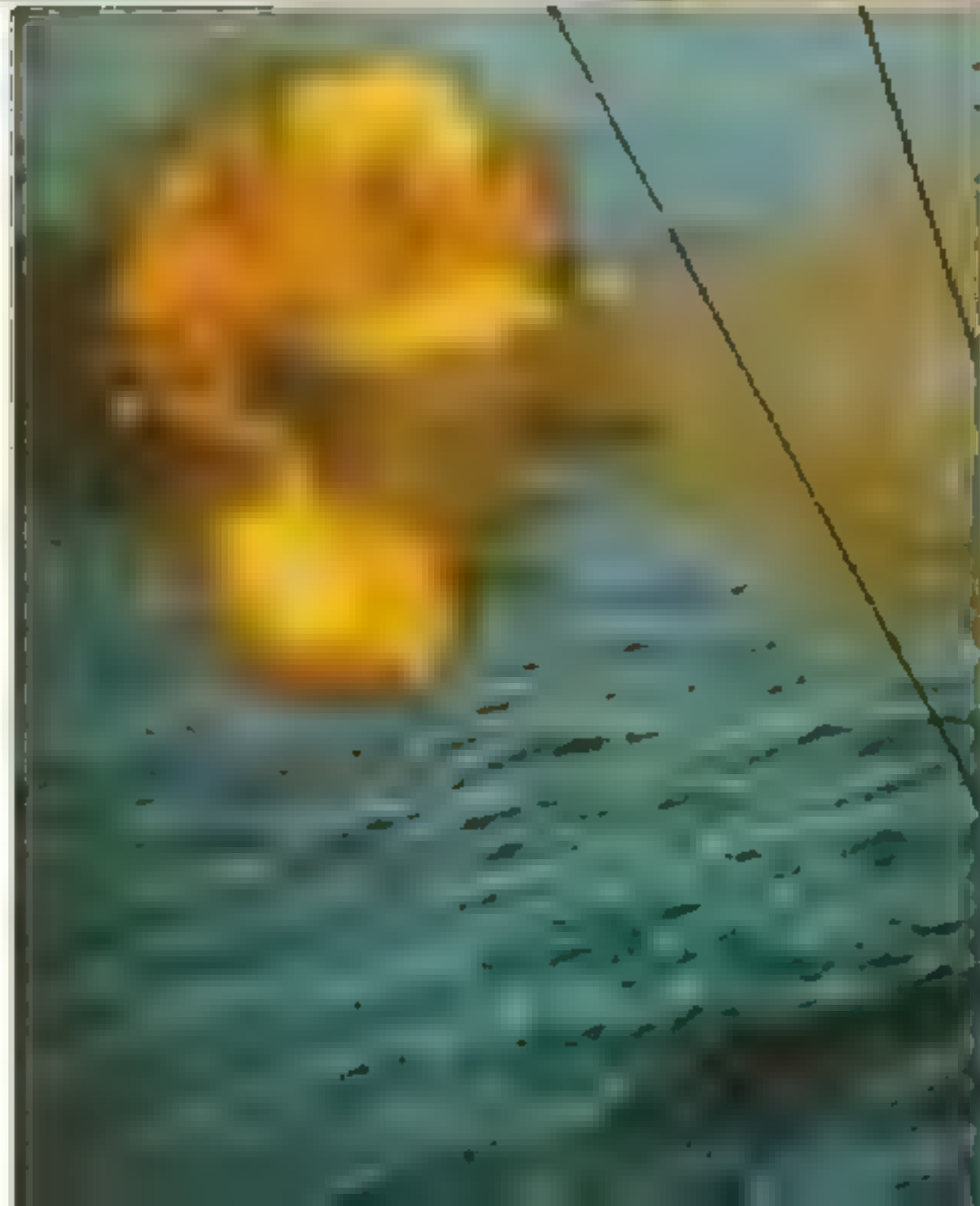
The battleships are now coming into play. The Navy's long rifles are belching flame and blast enemy targets. The Navy's long rifles are belching flame and blast enemy targets. The Navy's long rifles are belching flame and blast enemy targets.

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the pattern of mobile support, developed by Americans during World War II and refined in Korea, that has revolutionized naval warfare. Much credit for developing the under-way replenishment system goes to the Service Force in the Pacific. Current commander of these forces, Rear Adm. B. B. Biggs, says, "We can support the fleet anywhere, anytime, from the Aleutians to Madagascar."

Supply of the fleet begins with the problem of stocking and controlling an inventory of 589,482 items. Eighty percent of the business is done in 20 percent of the "line." So mobile support isn't stock only the 60,000 things used most, plus some "insurance" items, such as mines and torpedoes.

Few Americans realize the truly vast distances of the Pacific Ocean. Many Easterners, accustomed to think of oceans in terms of the 3,000 miles across the Atlantic to France and England, are amazed that it is more than 7,000 miles from San Francisco to the Philippines, and more than 6,000 to Korea.

Headquarters at Hawaii had to anticipate needs on the Korean bomb line by six weeks. Human nature leads every ship to want a full stock of everything it can possibly need. But, by careful analysis of rates of use and study of future operational plans, we were able to cut ammunition deliveries by 50 percent without reducing combat theater operations.

Floating Bases Follow the Fleet

Sasebo (Saseha), a former Japanese naval base near Korea Strait in westernmost Japan, is the port which has given logistic support to the fleet while operating off the bomb line. But few American warehouses line the Sasebo water front. As Admiral Biggs puts it, "With mobile support, the fleet is no longer tied to a palm tree."

Virtually everything is afloat, from hospitals and machine tools to barracks and electronic repair shops. Even small craft, the dories and gas, can be picked up by LSDs and moved at a moment's notice to Buckner Bay or Subic, wherever fast-moving developments in the Far East might dictate.

From the green hills surrounding Sasebo harbor you could watch the mule run start as the supply train got under way, sailed past swarms of vessels—many flying the varied flags of the United Nations—and moved out to sea for its regular rendezvous with the fleet. The next day, somewhere off Korea, the speeding formation of battleships, cruisers, carriers, and destroyers would slow for the key to our success in mobile support: replenishment at sea (pages 536, 544, and 577).

En route, this replenishment group would steam the strait past Tsushima, scene of the

disastrous Russian naval defeat by the Japanese under Admiral Togo during the Russo-Japanese War of 1904-05.

Standing on the bridge of a carrier like the veteran *Princeton*, you watch her go alongside an oiler and hear shotguns crack as "messenger" lines are shot to the clutter of ration crates, bombs, mail sacks, and repair parts on her deck. The light lines give way to heavy ones for the transfer of cargo and of hoses that pump oil and aviation gas to depleted carrier tanks.

Striking Power Doubled

By such means a carrier can be readied to fight again in four hours. Dry cargo moves across the lines at 100 tons an hour, five times as fast as stevedores can handle it across a dock. Commanding officers say they prefer to replenish at sea.

The practice, moreover, is one of the best things that has happened to taxpayers since World War II began, for one task force can do the work of two.

Only the crew's morale or battle damage requires a ship to return to port. What is more, mobile support reduces the need for a multitude of shore bases.

Replenishment Lines give the fleet a change of pace. Amid the bustle of the hangar deck, certain scenes are remembered—a sailor, with an airtight envelope between his teeth, leaning against a 2,000-pound bomb and reading a letter, or a boatswain's mate in a battle helmet trying to make the shrill call of his anachronistic pipe heard above the music of the ship's band on the flight deck above.

If you transfer by sarging, swinging highline to the decks of the oiler USS *Cacapon* alongside, you find men hard at work rolling ammunition into skids, breaking out chilled meat and vegetables from reefer boxes, or hauling on highline hawsers in a hearty fashion that recalls the days of sail.

Measure the service force mobile support effort this way. During the Korean War more than 2,000,000 tons of dry cargo were moved across the Pacific to the fleet. That is more than moves overseas through Los Angeles harbor in a year. In addition, 400,000 tons of ammunition were delivered.

135 Million Christmas Letters

Mail is a big and important item in the Navy, much of it moving by air. Last Christmas alone post offices of the Pacific Fleet delivered 135,000,000 letters.

Supply is more, however, than food and ammunition, mail and paint. It is recreation, character, and health as well. The Navy's film distribution system has put the latest

(Text continued on page 561)



A Flattop, Picking up Speed, Prepares to Launch a Jet Strike

Two fighters soon to be thrown skyward, stretch astide the catapults on the deck of the flattop. The flattop's main deck, with its catapults, will soon be ready to launch a jet strike. The flattop's main deck, with its catapults, will soon be ready to launch a jet strike.

Jet bombers climb quickly to 20,000 feet or more, where they can drop their bombs and then return to the carrier. The flattop's main deck, with its catapults, will soon be ready to launch a jet strike. The flattop's main deck, with its catapults, will soon be ready to launch a jet strike.



[illegible][illegible][illegible]



Two Panther Jets Screen Away over the Chaggy Sea in Japan. Another Taxis into the Capital

The Panther jets were seen flying over the Chaggy Sea in Japan. Another Taxis into the Capital. The Panther jets were seen flying over the Chaggy Sea in Japan. Another Taxis into the Capital. The Panther jets were seen flying over the Chaggy Sea in Japan. Another Taxis into the Capital.

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movies on combat screens first, then routed them back to rear areas; it serves more theaters than many a Stateside chain.

Through a system of "circuit-riding" chaplains, who shuttle through the fleet, religious counsel reaches even the smallest craft. Navy medical officers and dentists watch the health of a quarter of a million Americans in the Pacific; and Navy ships fully equipped with laboratories for the analysis of new and alien diseases have helped stamp out epidemics in South Korea, Okinawa and the Philippines.

There have been substantial advances in the unification of supply as well as command since World War II. For example, the 1st Marine Division and 1st Marine Aircraft Wing ashore in Korea were supplied rations through Army sources.

Going into action in August, 1950, Marine ground forces were not relieved until May of this year. At the end, Maj. Gen. Edwin A. Pollock's command, which covered a 30-mile front embracing the "low-level" invasion route to Seoul and the Fannunjom area, numbered more than 30,000 men, including 5,300 KMC's (members of the Korean Marine Corps). Of the Americans, about half were regulars. General Pollock refused to make the distinction. "Once they're Marines, they're professionals," he says.

Asked his opinion of the newly trained KMC's on his left flank, the general replied, "I feel secure. Those fellows are fighters, and they're just as proud of being Marines as we are. We have to be very careful to call them KMC rather than ROK. They insist on our camouflaged-type of helmet, and they've even set Korean words to our Marine 'song'."

The past year you have read much of the Marines fighting for outposts with names like Carson and Vegas, and hills like Punch Bowl. Once truce talks began, action was limited to an aggressive defense. All that could be contended was control of the ground.

* Hong Kong Merchants Set Up Shop Aboard the Destroyer *Lafberg*

Whenever an American naval vessel puts in to Hong Kong's harbor, it is welcomed by a deluge of Chinese merchants all competing vigorously. Boat-bag salesmen offer to patch the ship or repair canvas for the privilege of carrying goods aboard. Many disappointed vendors must be kept away with fire hoses.

Aboard the *Lafberg*'s crowded weather deck sailors pick up bargains in salt, shoes, and groceries. An itinerant tailor repairs uniforms and sews on rank marks. Depth charges line the side; fueling hose drapes the armor shield at left. Green-topped "waka-waka" boats and sampans cluster around *Lafberg* awaiting passengers to shore. A U. S. Navy transport lies in the harbor.

* See also *Life* magazine.

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having immediate tactical value for artillery observation or harassing fire. Most of the skirmishes occurred at night.

Battalion commander Lt. Col. Henry Lawrence, when asked if his share of the line would hold against an all-out Communist attack, said, "Sit! If they'd only try just that. All we need is to get at them!"

Marines Supplied at Night

It was a Marine rule that every man in the line share in some aggressive patrol every four days, but parties sent out to man an outpost stayed a week or more. The outposts were supplied with ammunition, fortification materials, and mail at night through mine fields. The mail was burned when read, lest it fall into enemy hands.

Marine planes have been fully integrated with the Fifth Air Force in Korea and have often been assigned to close support of the Marine-held portion of the line.

When I discussed the effect of Korean geography on air operations with Maj. Gen. Vernon E. Megee, Commander of the 1st Marine Aircraft Wing, the general said, "It is good in one way—the mountains force railroads and highways to follow the coastline or the few valleys, so we know where supplies are moving. But it's bad in that all these hills look alike from 20,000 feet at 600 miles an hour. The kids say it's not like terrain at home, although I think it's like the brown foothills of Arizona."

To help pilots find their objective, relief maps were molded from papier-mâché for all enemy-held Korea. Strapped to a flyer's thigh, these realistic models have been a great aid in fixing objectives confused by snow haze, and the shadows cast by the hills themselves.

For close support work, the Marines have used experienced and specially trained pilots who were sent to forward ground observation posts to talk flights onto targets. They knew the problems of both pilots and ground troops.

Listening in on these tactical radio channels, I have heard such centers guiding flight leaders four miles above to pinpoint targets. I have also heard the last words of a pilot bailing out of his jet, and ships of our blockading force reporting the coordinates of an enemy boat detected by radar. War today is waged by electronics and techniques.

A Marine photo-reconnaissance squadron, flying jets from a South Korean airfield, swept over the coast of Korea. Flying planes with names like *Cyano* and *Durante*—their noses are extended to hold a battery of cameras and range finders as long as a man—Marines have mapped up to 5,000 square



Marines Aboard an LST Above out of Incheon Harbor for Amphibious Exercises. A Land-based Airplane Checks a Japanese Fighter Above Port Arthur. The Japanese Airplane is seen in the sky above the harbor. The Japanese Airplane is seen in the sky above the harbor.

Figure 1 shows the results of the regression analysis for the dependent variable $\ln(\text{turnover})$. The results show that the regression model is significant at the 1% level ($F = 10.12$, $p < 0.01$). The adjusted R^2 is 0.85, indicating that the model explains 85% of the variance in the dependent variable. The regression coefficients are as follows: $\beta_1 = 0.12$, $\beta_2 = 0.08$, $\beta_3 = 0.05$, $\beta_4 = 0.03$, $\beta_5 = 0.02$, $\beta_6 = 0.01$, $\beta_7 = 0.01$, $\beta_8 = 0.01$, $\beta_9 = 0.01$, $\beta_{10} = 0.01$, $\beta_{11} = 0.01$, $\beta_{12} = 0.01$, $\beta_{13} = 0.01$, $\beta_{14} = 0.01$, $\beta_{15} = 0.01$, $\beta_{16} = 0.01$, $\beta_{17} = 0.01$, $\beta_{18} = 0.01$, $\beta_{19} = 0.01$, $\beta_{20} = 0.01$, $\beta_{21} = 0.01$, $\beta_{22} = 0.01$, $\beta_{23} = 0.01$, $\beta_{24} = 0.01$, $\beta_{25} = 0.01$, $\beta_{26} = 0.01$, $\beta_{27} = 0.01$, $\beta_{28} = 0.01$, $\beta_{29} = 0.01$, $\beta_{30} = 0.01$, $\beta_{31} = 0.01$, $\beta_{32} = 0.01$, $\beta_{33} = 0.01$, $\beta_{34} = 0.01$, $\beta_{35} = 0.01$, $\beta_{36} = 0.01$, $\beta_{37} = 0.01$, $\beta_{38} = 0.01$, $\beta_{39} = 0.01$, $\beta_{40} = 0.01$, $\beta_{41} = 0.01$, $\beta_{42} = 0.01$, $\beta_{43} = 0.01$, $\beta_{44} = 0.01$, $\beta_{45} = 0.01$, $\beta_{46} = 0.01$, $\beta_{47} = 0.01$, $\beta_{48} = 0.01$, $\beta_{49} = 0.01$, $\beta_{50} = 0.01$, $\beta_{51} = 0.01$, $\beta_{52} = 0.01$, $\beta_{53} = 0.01$, $\beta_{54} = 0.01$, $\beta_{55} = 0.01$, $\beta_{56} = 0.01$, $\beta_{57} = 0.01$, $\beta_{58} = 0.01$, $\beta_{59} = 0.01$, $\beta_{60} = 0.01$, $\beta_{61} = 0.01$, $\beta_{62} = 0.01$, $\beta_{63} = 0.01$, $\beta_{64} = 0.01$, $\beta_{65} = 0.01$, $\beta_{66} = 0.01$, $\beta_{67} = 0.01$, $\beta_{68} = 0.01$, $\beta_{69} = 0.01$, $\beta_{70} = 0.01$, $\beta_{71} = 0.01$, $\beta_{72} = 0.01$, $\beta_{73} = 0.01$, $\beta_{74} = 0.01$, $\beta_{75} = 0.01$, $\beta_{76} = 0.01$, $\beta_{77} = 0.01$, $\beta_{78} = 0.01$, $\beta_{79} = 0.01$, $\beta_{80} = 0.01$, $\beta_{81} = 0.01$, $\beta_{82} = 0.01$, $\beta_{83} = 0.01$, $\beta_{84} = 0.01$, $\beta_{85} = 0.01$, $\beta_{86} = 0.01$, $\beta_{87} = 0.01$, $\beta_{88} = 0.01$, $\beta_{89} = 0.01$, $\beta_{90} = 0.01$, $\beta_{91} = 0.01$, $\beta_{92} = 0.01$, $\beta_{93} = 0.01$, $\beta_{94} = 0.01$, $\beta_{95} = 0.01$, $\beta_{96} = 0.01$, $\beta_{97} = 0.01$, $\beta_{98} = 0.01$, $\beta_{99} = 0.01$, $\beta_{100} = 0.01$, $\beta_{101} = 0.01$, $\beta_{102} = 0.01$, $\beta_{103} = 0.01$, $\beta_{104} = 0.01$, $\beta_{105} = 0.01$, $\beta_{106} = 0.01$, $\beta_{107} = 0.01$, $\beta_{108} = 0.01$, $\beta_{109} = 0.01$, $\beta_{110} = 0.01$, $\beta_{111} = 0.01$, $\beta_{112} = 0.01$, $\beta_{113} = 0.01$, $\beta_{114} = 0.01$, $\beta_{115} = 0.01$, $\beta_{116} = 0.01$, $\beta_{117} = 0.01$, $\beta_{118} = 0.01$, $\beta_{119} = 0.01$, $\beta_{120} = 0.01$, $\beta_{121} = 0.01$, $\beta_{122} = 0.01$, $\beta_{123} = 0.01$, $\beta_{124} = 0.01$, $\beta_{125} = 0.01$, $\beta_{126} = 0.01$, $\beta_{127} = 0.01$, $\beta_{128} = 0.01$, $\beta_{129} = 0.01$, $\beta_{130} = 0.01$, $\beta_{131} = 0.01$, $\beta_{132} = 0.01$, $\beta_{133} = 0.01$, $\beta_{134} = 0.01$, $\beta_{135} = 0.01$, $\beta_{136} = 0.01$, $\beta_{137} = 0.01$, $\beta_{138} = 0.01$, $\beta_{139} = 0.01$, $\beta_{140} = 0.01$, $\beta_{141} = 0.01$, $\beta_{142} = 0.01$, $\beta_{143} = 0.01$, $\beta_{144} = 0.01$, $\beta_{145} = 0.01$, $\beta_{146} = 0.01$, $\beta_{147} = 0.01$, $\beta_{148} = 0.01$, $\beta_{149} = 0.01$, $\beta_{150} = 0.01$, $\beta_{151} = 0.01$, $\beta_{152} = 0.01$, $\beta_{153} = 0.01$, $\beta_{154} = 0.01$, $\beta_{155} = 0.01$, $\beta_{156} = 0.01$, $\beta_{157} = 0.01$, $\beta_{158} = 0.01$, $\beta_{159} = 0.01$, $\beta_{160} = 0.01$, $\beta_{161} = 0.01$, $\beta_{162} = 0.01$, $\beta_{163} = 0.01$, $\beta_{164} = 0.01$, $\beta_{165} = 0.01$, $\beta_{166} = 0.01$, $\beta_{167} = 0.01$, $\beta_{168} = 0.01$, $\beta_{169} = 0.01$, $\beta_{170} = 0.01$, $\beta_{171} = 0.01$, $\beta_{172} = 0.01$, $\beta_{173} = 0.01$, $\beta_{174} = 0.01$, $\beta_{175} = 0.01$, $\beta_{176} = 0.01$, $\beta_{177} = 0.01$, $\beta_{178} = 0.01$, $\beta_{179} = 0.01$, $\beta_{180} = 0.01$, $\beta_{181} = 0.01$, $\beta_{182} = 0.01$, $\beta_{183} = 0.01$, $\beta_{184} = 0.01$, $\beta_{185} = 0.01$, $\beta_{186} = 0.01$, $\beta_{187} = 0.01$, $\beta_{188} = 0.01$, $\beta_{189} = 0.01$, $\beta_{190} = 0.01$, $\beta_{191} = 0.01$, $\beta_{192} = 0.01$, $\beta_{193} = 0.01$, $\beta_{194} = 0.01$, $\beta_{195} = 0.01$, $\beta_{196} = 0.01$, $\beta_{197} = 0.01$, $\beta_{198} = 0.01$, $\beta_{199} = 0.01$, $\beta_{200} = 0.01$, $\beta_{201} = 0.01$, $\beta_{202} = 0.01$, $\beta_{203} = 0.01$, $\beta_{204} = 0.01$, $\beta_{205} = 0.01$, $\beta_{206} = 0.01$, $\beta_{207} = 0.01$, $\beta_{208} = 0.01$, $\beta_{209} = 0.01$, $\beta_{210} = 0.01$, $\beta_{211} = 0.01$, $\beta_{212} = 0.01$, $\beta_{213} = 0.01$, $\beta_{214} = 0.01$, $\beta_{215} = 0.01$, $\beta_{216} = 0.01$, $\beta_{217} = 0.01$, $\beta_{218} = 0.01$, $\beta_{219} = 0.01$, $\beta_{220} = 0.01$, $\beta_{221} = 0.01$, $\beta_{222} = 0.01$, $\beta_{223} = 0.01$, $\beta_{224} = 0.01$, $\beta_{225} = 0.01$, $\beta_{226} = 0.01$, $\beta_{227} = 0.01$, $\beta_{228} = 0.01$

The first part of the paper is devoted to the study of the asymptotic behavior of the solutions of the system (1.1) as $\epsilon \rightarrow 0$. In the second part, we study the asymptotic behavior of the solutions of the system (1.1) as $\epsilon \rightarrow 0$. In the third part, we study the asymptotic behavior of the solutions of the system (1.1) as $\epsilon \rightarrow 0$.

20

Figure 1 illustrates the experimental setup. A participant is seated at a table, looking at a screen. On the screen, a green dot represents the starting point, and a red dot represents the target. The distance between these two dots is labeled 'Distance (cm)'. The participant's hand is positioned at the starting point, labeled 'Hand'.



miles of Korea in a day. Including overlaps, this would cover a path two miles wide from San Francisco to Washington, D. C.

Marine aviation in Korea provided many contrasts. I recall a secret underground control center where, almost magically, the course of every plane over Korea was traced. Standing in a wind-swept wheat field overhead I watched a stoic-faced Korean till the dry soil with a wooden plow unconcerning of the marvels beneath his feet.

Near a desolate hut, where aviators report the results of their mission, I saw a returned pilot, still in his crash helmet, indulging in his latest amusement in a cold and barren field. With arm outstretched, he was turning slowly while holding the wire that controlled a model airplane in flight.

Helicopters Performed Near-miracles

Navy men off Korea have often used their spare time constructively. One leather photo pilot, dissatisfied with the detail in the pictures he brought back, felt there should be some way to compensate for jet speeds to bring depth to aerial photographs, which are characteristically flat.

The pilot and a machinist's mate worked nights after combat and finally came up with the first successful image-compensation camera. Its details are still secret, but the result is pictures so clear that targets stand out as never before.

Helicopters have continued to perform near-miracles daily. On one of my nighttime visits to the front two Marines were wounded near Lv. In the time it took to examine and dress their wounds, a "heli" arrived, and, guided only by flares, landed in the dark and was ready for their evacuation. The medical officer said they would be under surgery on a hospital ship less than an hour after being hit (pages 563 and opposite).

A Marine regiment in combat was supplied for three days entirely by a flight of helos. Yet last Christmas General Pollock was able to visit some 20 units in his command in one day. The trip, he said, would have taken a week by jeep.

Ingenuity has not been confined to combat problems. For any sailor or marine, the first rule of war is to be as comfortable as circumstances permit while waiting for something to happen. Thus mortar casings become chimneys, and old tin cans are strung to serve as doorknobs in marine dugouts.

But if Americans have found modest comforts in Korea, they didn't get them from local resources. During much of recorded history Korea has been a battleground for alien forces. Poor in the beginning, the country is now bereft. The most simple re-

quirements, such as timber for fortifications and ice for messes, come from Japan.

Civilians by the hundreds of thousands have been killed during three years of war. There are more than 130,000 war orphans. Though the United Nations has already spent vast sums on an emergency relief program, more than half the millions of refugees from the north are still homeless.

Under the true test Army, Navy, and Air Force will operate jointly, as they have in war. Cooperation of forces under joint command has worked well in Korea. The air has been completely integrated. The Air Force's medium bombers, whose great value has been limited by the confined combat area, have been escorted by Navy and Marine jets as well as the fighters of their own service.

Off the west coast of Korea British and American light carriers have rotated assignments without regard to flags. British, Australian, Canadian, Colombian, New Zealand, Thai and Netherlands and South Korean destroyers and frigates formed a large segment of the west coast blockade force. Ashore, Marines and United States and Allied ground forces have been deployed under American Army commanders with little reference to uniform or nationality.

Just as a stable, free Korea is essential to our protection of Japan, friendly forces on Okinawa and Formosa are essential to the defense of both Japan and the Philippines.

Planes Patrol China Coast

With its blue-tiled airport terminal, four-lane highways and typhoon-proof barracks, the southern end of the long, narrow island of Okinawa appears as American as the grave-in-theater. Primarily an Air Force center, Okinawa is also a base for the naval patrol of Formosa Strait.*

Like Sasebo, Buckner Bay has the facilities to serve in the mobile support of the fleet if action should develop in Southeast Asia.

From Okinawa's Kadena Air base two-engineered Neptunes have been taking off on grueling 14-hour, day and night searches of the waters off the China Coast. Their primary purpose is to detect in its early stages any assault against Formosa by Red China. But a profitable by-product is the disclosure of ships and lines trading with the Chinese Communists (page 562).

Little escapes these radio-equipped Neptunes, which fly low to photograph, identify, and plot every vessel passing through the Formosa Strait. They have made more than 1,000 such inter-

* See "Okinawa, Pacific Outpost," 23 illustrated pages with full legends, NATIONAL GEOGRAPHIC MAGAZINE, April, 1950.



Nurses on *Hague* Lounge Beneath the Hospital Ship's Identifying Cross of Light

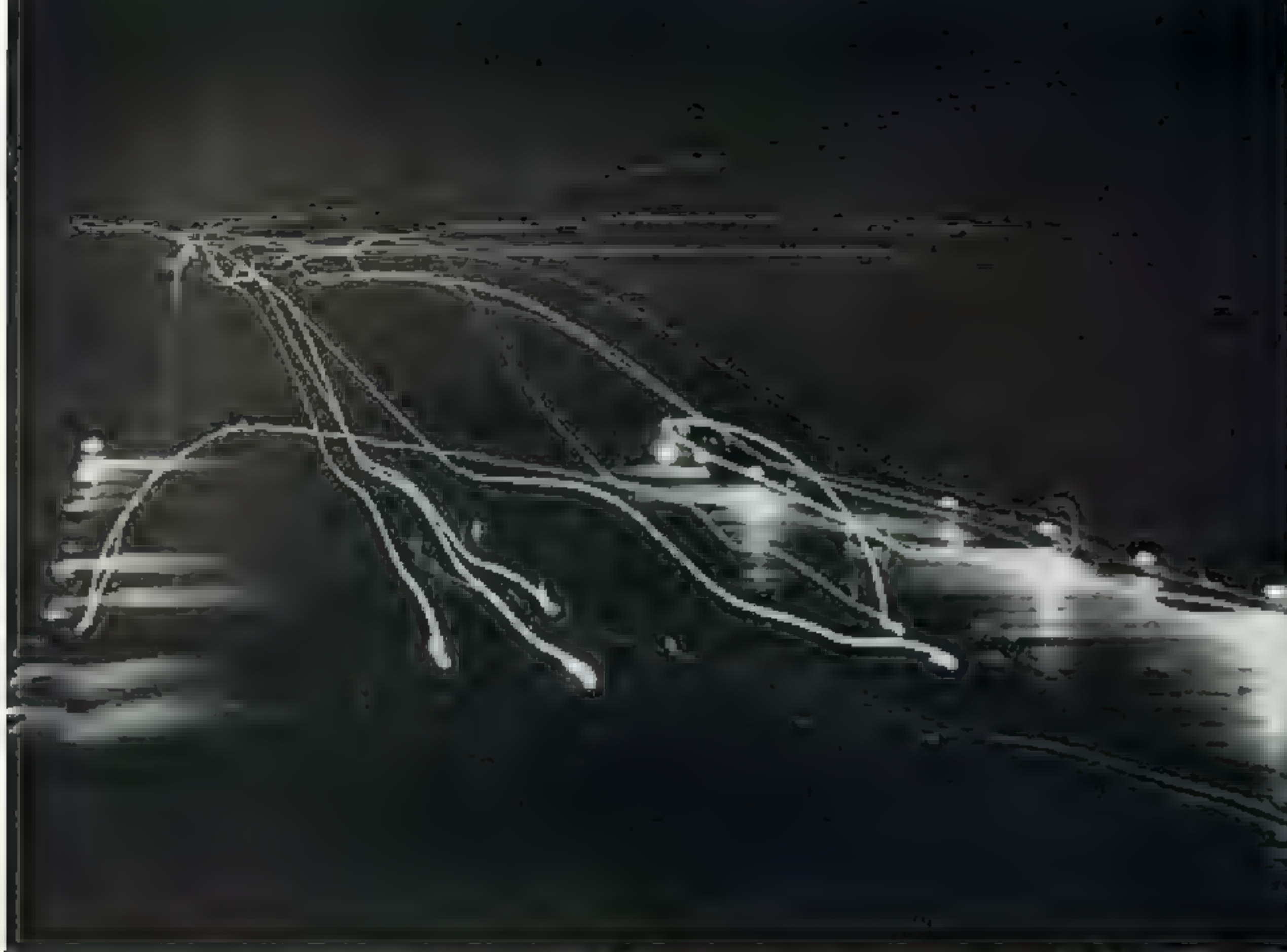
At the *Hague*, nurses and other medical personnel tended to the wounded and the sick. For the first time, the Red Cross was able to provide medical care to the wounded in the field.



500

Hawking Down in Italy's Countryside: Military Bombers Scatter Out Enemy Detents

Navy and army forces in the region of the sea or set fire to farm to give that sheltered area. The...
... In a moment the men had all been shot...
... A great...



Night Hacklers Landing on Keweenaw, Waves Light Trails Like Frantic Tracer Bullets

As the moonlight fell on the dark water of the lake, the light trails of the bioluminescent organisms were like tracer bullets, falling from the sky and lighting up the water. The light trails were like a million tiny stars, falling from the sky and lighting up the water.

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Island Fortress of Fortinos

Further south, on the island of Fortinos, the light trails of the bioluminescent organisms were like tracer bullets, falling from the sky and lighting up the water. The light trails were like a million tiny stars, falling from the sky and lighting up the water.

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*See footnote on page 106 for details of the attack on the island of Fortinos.



• Music and Activities . . .

A group of children and adults were sitting on a bench outdoors, watching a performance. A child in a red shirt was standing and waving their arms. The children were all looking towards the stage area.

• A Mine-sweeping "Pig" Gets Fresh Make-up

A group of children and adults were sitting on a bench outdoors, watching a performance. A child in a red shirt was standing and waving their arms. The children were all looking towards the stage area.

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—Continued on page 518—



... Photo Sales on Deck

A major sale of photographs and other items was held on the deck of the ship. The sale was held in the main hall of the ship, and the items were displayed on tables. The items included photographs of the ship, the crew, and the war. The sale was a success, and the items were sold quickly.

An Old Side Winder Has a New Side

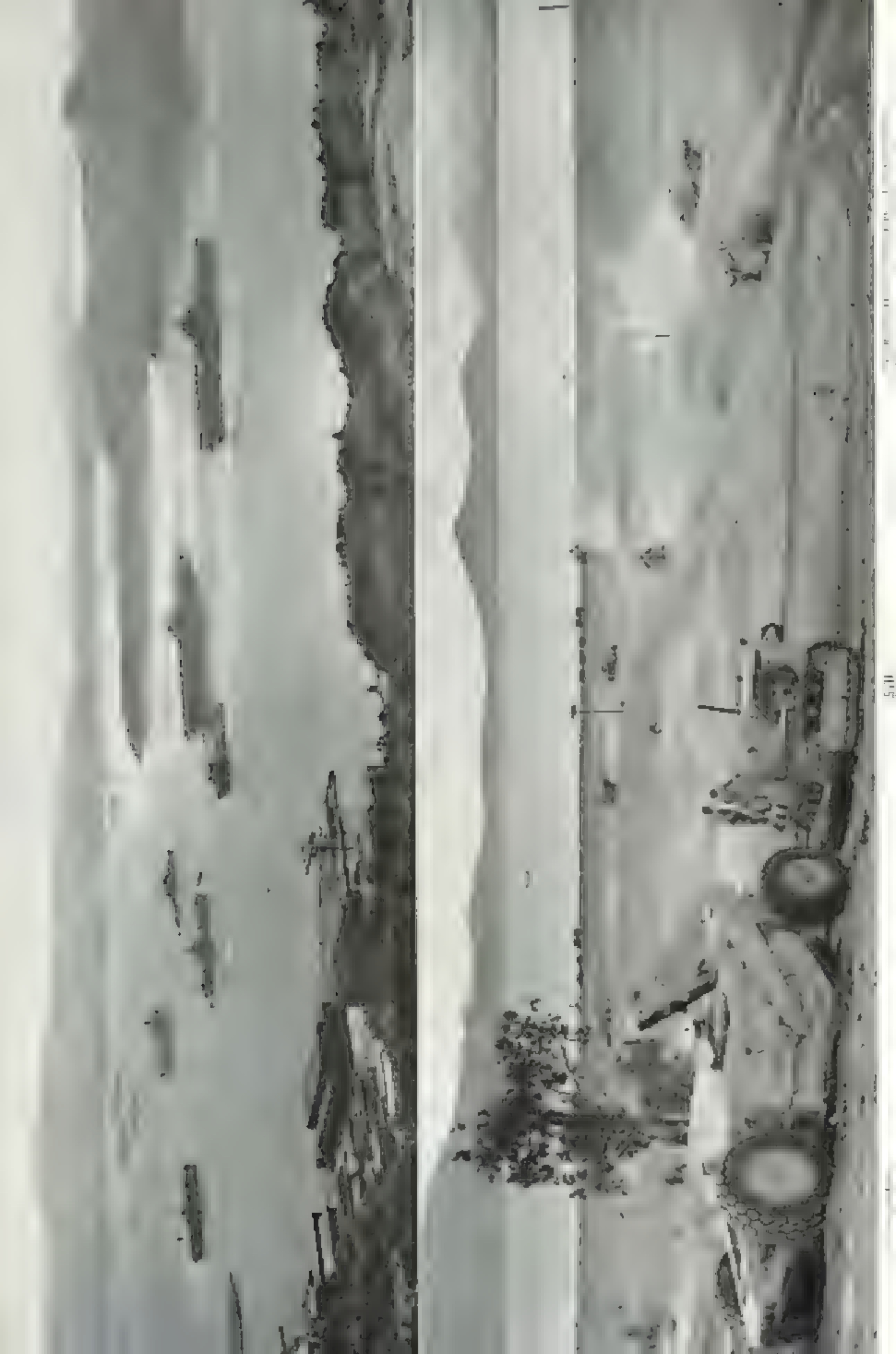
The ship's side winder, which had been in use for many years, was replaced by a new one. The new side winder was a modern one, and it was installed on the ship. The old side winder was a simple one, and it was replaced by the new one. The new side winder was a great improvement, and it was well-received by the crew.

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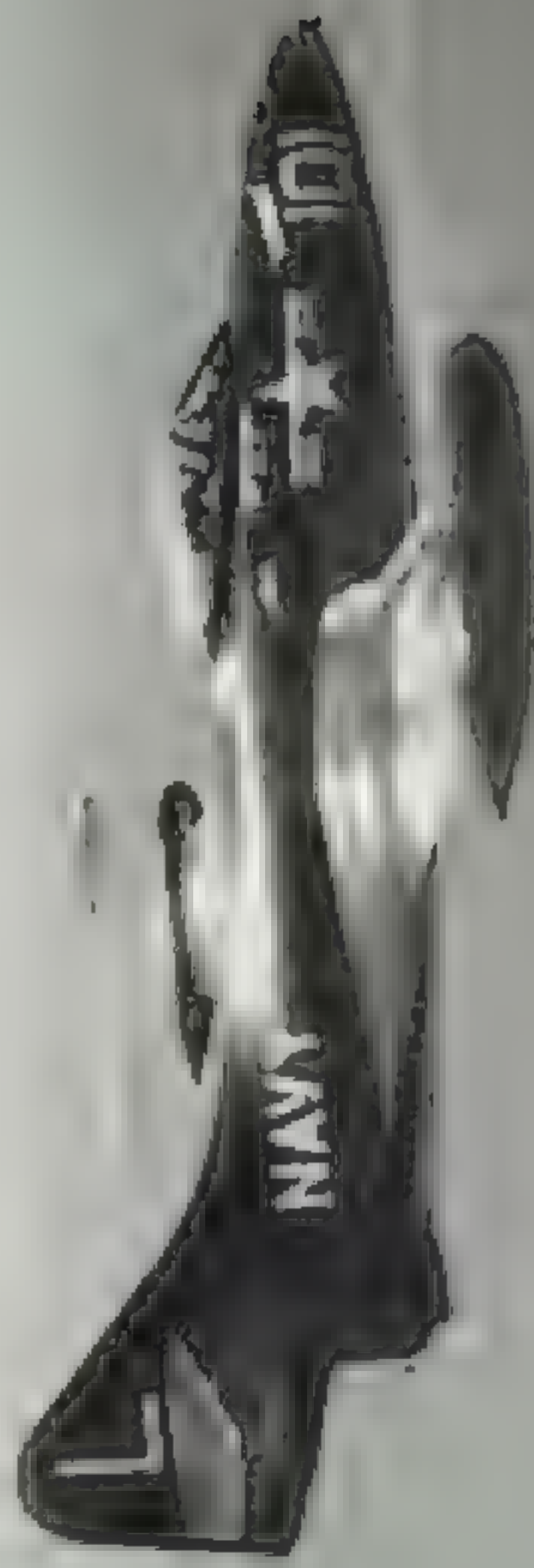




Two Jet Bombers on a Dangerous Mission, Task Force 77's Ships Spell Doom and Security as They Strike Across the Eastern Sea

In a matter of minutes, the two B-57s had been shot down by the enemy's anti-aircraft fire. The two jet bombers were flying low over the water, and the enemy's anti-aircraft fire was very accurate.

The two jet bombers were flying low over the water, and the enemy's anti-aircraft fire was very accurate. The two jet bombers were flying low over the water, and the enemy's anti-aircraft fire was very accurate.





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6. General Spotters Call Their Shots on a Model of Korea's Isolated Hills

A group of soldiers in olive drab uniforms are standing in formation on a grassy field. In the background, a large, multi-story building is visible. The soldiers are looking towards the camera.

7. Freedom Village: Months of Misery End for a Registered Prisoner

A group of soldiers in olive drab uniforms are standing in formation on a grassy field. In the background, a large, multi-story building is visible. The soldiers are looking towards the camera.



and Publishing, Inc. of New York, New York, and the American Book Company, New York, New York, are the publishers of this book.

The first step in the process of creating a new product is to identify a market need. This involves conducting market research to understand the preferences and behaviors of potential customers. Once a need is identified, the next step is to develop a concept that addresses this need. This concept should be unique, valuable, and feasible. The third step is to create a prototype, which is a preliminary model of the product. This allows the team to test the concept and make necessary adjustments. The fourth step is to conduct a feasibility study, which evaluates the technical, financial, and operational aspects of the product. Finally, the team must secure funding to bring the product to market. This can be achieved through various means, such as venture capital, crowdfunding, or personal savings. Once funded, the team can proceed with the development and launch of the product.

A Captain Who Became an Adverser Here in the Hands of a Renegade Navy Wife in 1880

From the first of the year to the last, the Captain's life was a life of constant struggle and adversity. He was a man of high character and high ability, but he was also a man of high ambition and high energy. He was a man who was not content with the status quo, and he was a man who was not content with the way things were. He was a man who was not content with the way things were, and he was a man who was not content with the way things were.



His current responsibilities are divided between assistance to the Philippines in building coastal-patrol and harbor-defense forces and the development of our base and new naval air station on Subic Bay.

I flew with Admiral Cruzen across Manila Bay and the plains of Panapanga to Subic not long ago. With us went Capt. Chester Smith, of my staff. As we circled Corregidor, viewing the charred remnants of warehouses and coast-artillery batteries and the chalk-white Malinta Tunnel entrances, he pointed out the inlet where he surfaced his submarine four times during the historic siege of Bataan to deliver supplies and to evacuate women and wounded.

In the calm of a bright tropic morning we flew on over Mariveles and other Bataan villages reminiscent of those stirring times. Forests on the peninsula still showed marks of shelling, and, as we approached Subic, old hulls could yet be seen, rusting in little coves.

We landed at Cubi Point, where a big new naval air station is being carved from the mountains that ring Subic Bay. It is an unusual place for an air base, but it offers the operational savings of an airstrip on deep water, where carriers can unload their "duds"—planes so badly damaged they can't be flown ashore.

Seabees' Biggest Job

Cubi Point is the biggest earth-moving job ever undertaken by the U. S. Navy. It has occupied 3,000 Seabees in the bamboo forests and swamps of Subic Bay two years. Using World War II equipment, they will finally move more than 23,000,000 yards of fill and dredge a carrier anchorage and a seaplane harbor in the course of the job.

In their tent camp overlooking the swirling dust that now characterizes Cubi Point in the dry season, the Seabees have monkeys and pythons as pets, build crude furniture from nearby stands of mahogany, and have their second movie show at 1:00 a.m., when the swing shift comes off.

On Subic Bay also is the Navy Base and native village of Olongapo, both leveled by Japanese in the early days of World War II. The town is included in the area retained by agreement with the Philippine Government, and is under Navy jurisdiction.

Subic's officers have made Olongapo's administration their hobby. Proudly they point out that its infant mortality is the Philippines' lowest and its water the purest. One officer, while on duty there, organized Sunday parties to scavenge lumber for a civic need. Today you see the result in a modern building—Jackson High School.

A 1,700-mile arc drawn from Subic em-

braces Japan, Korea, Formosa, Hong Kong, Indochina, and Malaya, and with them the historically strategic cities of Dairen, Shanghai, Victoria, Haiphong, Saigon, and Singapore. In case of necessity, Subic as a base could lend mobile support to the fleet in any of these areas.

Reclaiming Guam Goes American

Backing up Sasebo, Buckner Bay, and Subic is Guam, where any Far Eastern operation could be staged. There Americans and Filipino laborers now outnumber natives, and the Navy occupies a third of the island. Guam now is emerging from the Quonset period; myriad huts give way steadily to concrete barracks and stucco homes.

With so much building, Guam at times is labor-short, despite Seabees, civilian construction workers, and the Filipinos. Rear Adm. Ernest W. Litch, commander of the Marianas, says this has so inflated wage rates in civilian enterprises, such as clubs and restaurants, that Guamanians demand and get better rates than west coast workers in similar establishments.

Business at the Navy Exchange reflects the presence of wives and children. Biggest demand is for utensils like cheese graters and garbage pails.

American children venturing to the hills after school still find old Japanese machine guns and unexploded shells. The latter keep bomb-disposal men busy.

Athletics are the major outlet for enlisted men there. Competition is keen, and winning teams travel from Japan to San Diego in intra-fleet tournaments. Stateside sports are eagerly followed. Because of time differences, they are usually rebroadcast some 10 hours after the event, lending an unreal air to the otherwise American scene.

It is a long way from Guam to Hong Kong, but like every other Navy man in the Far East, those stationed in the Marianas hope to make it.

The quiet, the good food, and the European cities of Hong Kong convinced me that the Crown Colony should become a major rest and recreational center for men and officers of the fleet. In recent years American ships of every description have rotated even more frequently through this colonial port.

When the now familiar lines of an American ship show up in the entrance to the harbor, "walla-wallla" boats—water taxis—put out from Victoria and Kowloon with Cokes and jacks, shoeshine boys and tailors. By the time the anchor is down, scores of craft are jostling for position by the sea ladder (page 560).

The measured, pleasant life of Hong Kong's European residents goes on seemingly undis-



News Now Panel 12 is Under Threaten to Break Its Slender Tie with Karamojo

Refueling at sea goes on in fair weather or foul. Watch operators here, spraying drenching spray and blizzard, must be extra vigilant to maintain even tension on each cable between the ships. No net-jawed buoys or reel hose swages from tankers to extract. Another buoy (float) is already there.

... the free-wheeling, rowing, rowing, rowing of the free-wheeling hills of Communist-held China. The exultant, rowing, rowing, rowing of the Orient.

This Crown Colony is a theocratic state of 100,000 sq. km. on the south coast that transpires behind the Bamboo Curtain.

Background of Ideas

Visiting there you become aware of the Communist planning, begun years ago, that has won most of Asia for the Soviets. You find a total, total pattern of upheaval that has followed World War II. You find the complete apparatus that extends from Moscow to communities all over Asia, a system of youth organizations, political commissars, and study centers devoted solely to the Communist Idea. And you wonder how they do it in a friendly way.

and you want to get that end. It is perhaps a matter of time and brain and effort before we have Korea, China, and Japan, and the things that we have done.

and of course, a lot of people like to know
that our ideas are for

With this responsibility we have been entrusted a further and fundamental responsibility in the far East. For our power is also a source of peace and tranquillity. Many a vessel, fleeing from typhoons and earthquakes, has found at the sight of American ships which have brought rapid succor and understanding, and our trim blue-flags on liberty in foreign ports are often among our most effective ambassadors. We are going on well.

One of the great traditions of our naval service is the employment of fighting ships on perpetual missions to subvert terrorism and piracy. The USS Zumwalt (DDG 1000) is the latest example of this tradition.

But even if American sea power diminishes, the rest of the world is no the less free. They know that even though America is 5,000 miles away, she has a means of keeping her word.

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National Geographic Map Shows the Troubled Face of East Asia

A 2,300-mile sweep of the Far East, studded with place names of historic and tragic significance, appears on the National Geographic Society's new 10-color map, "China Coast and Korea," distributed with this issue to The Society's 2,150,000 member families throughout the world.*

The map should be used for reference while reading the article, "Our Navy in the Far East," by Admiral Arthur W. Radford (page 537).

So timely is the map that readers can hardly point to a section of it that is not featured in recent or current news dispatches.

Look, for example, in west-central Korea. There is Panmunjom, scene of the truce parleys between U.N. and North Korean negotiators. To the south is Seoul, capital of President Syngman Rhee's battered republic.

Korean Cease-fire Line Shown

A red cease-fire line, winding across Korea from the Sea of Japan to the Yellow Sea, indicates the 2½-mile-wide buffer zone established by the truce signed July 27, 1953, at Panmunjom. The line cuts through areas of bitter and costly fighting, many of them bearing unforgettable GI names such as Heartbreak Ridge, Bunker Hill, the Punch Bowl, Sniper Ridge, Old Baldy, and others.

Indochina's northernmost corner noses into the lower left section of the map. Places there, such as the French stronghold Hanoi, and Dien Bien Phu, also were linked with active war. Actually not a country, Indochina is merely a geographical term embracing the three Associated States under the French Union—Viet Nam, Cambodia, and Laos.

Most of the fighting between Communist forces and the French and their local allies has occurred in Viet Nam. Here, in the rice-rich, thickly populated Red (Kage) River Delta, which appears on your map, as many as 1,400 persons crowd the square mile.

The map shows the three main offshore garrisons serving as springboards for Chinese Nationalist guerrilla raids on Red-held territory. These are the Tachen Liehtao (Archipelago), Matsuo Tao (Island), and Quemoy and Little Quemoy. Chiang Kai-shek's Nationalists also hold some 33 smaller islands off the Fukien-Chientsang coast, plus Formosa and its 13 offshore islands and the 64 Pescadore (Penghu) in Formosa Strait.

The Communists recently massed a strong force on the Chekiang coast, only 12 miles from the Tachen group, and began exploratory attacks on that island complex.

To produce the map, your Society's car-

tographers worked 5,337 man-hours over a 6-month period. Many problems were encountered; among the thorniest was that of place-name spellings. Tientsin, for example, may be spelled also as Tien-ching, Tienchi, or Tien-ching shih. For Peking, in Manchuria, there are a dozen other spellings.

Since the maximum size of the usual supplement map is fixed by the size of the presser, the only way the cartographers could increase the map's scale was to put China on an angle (note the slant of the meridians). This way the scale became one inch to 55 miles. It would have been only half that had China been shown the usual way, with north at the top.

The map is constructed on an oblique Mercator projection computed for the great circle running northeast through the center of the map. Along this line distances are mathematically accurate between Hong Kong, Shanghai, Seoul, and Vladivostok. Since the whole strip extends only about 10° to each side, the maximum variation within it is only 1½ percent.

It is significant that if this 20° strip were extended around the globe, it would include Singapore on the southern tip of Southeast Asia and extend in the opposite direction to embrace Kamchatka, part of Alaska, and pass over Seattle, Washington. A ship's or a bomber's shortest course between Occident and Orient is directly along this strip.

Mountains in Two Colors

Mountains have been shaded in one and yellow-blue on the shadow side and yellow on the light, assuming the light comes from the northwest. Such a color scheme is particularly useful in this instance, for mountains dominate the map's land area.

Six shades of blue indicate the depth contours of the ocean floor—the lightest for the shallow continental shelf, darker shades for the deeper waters.

Two important new railways appear in the lower left corner of the map. One, considered a chief supply route for the Communists in Indochina, connects Liuhow in Kwangsi with Chuanankwan on the border. The second, between Liuhow and Kweiyang, is completed to Teyan and is a link in the proposed western Chinese trunk line. It presumably will extend northward to tie in with the trunk line.

* Senders may obtain additional copies of the China Coast and Korea map (and of all standard maps published by The Society) by writing to the National Geographic Society, Washington 6, D. C. Prices in the United States and elsewhere, 50c each on paper, \$1.00 on fabric; 1 dollar, 25c. All remittances payable in U. S. funds. Postpaid.

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The National Geographic Society was organized for the purpose of increasing and diffusing geographic knowledge among the people of the United States and throughout the world. It was organized in 1888, and since that time it has been steadily increasing its resources and its influence.

The Society's first and most important work was the publication of the National Geographic Magazine, which was first published in 1888. This magazine has since become one of the most popular and influential of its kind in the world.

In addition to the magazine, the Society has also published a number of other works, including books, pamphlets, and maps. These works have been widely distributed and have played a significant role in the dissemination of geographic knowledge.

The Society's work has also been carried out in the field of research. It has supported a number of expeditions and has provided financial assistance to a number of researchers. This work has led to a number of important discoveries and has helped to advance the field of geography.

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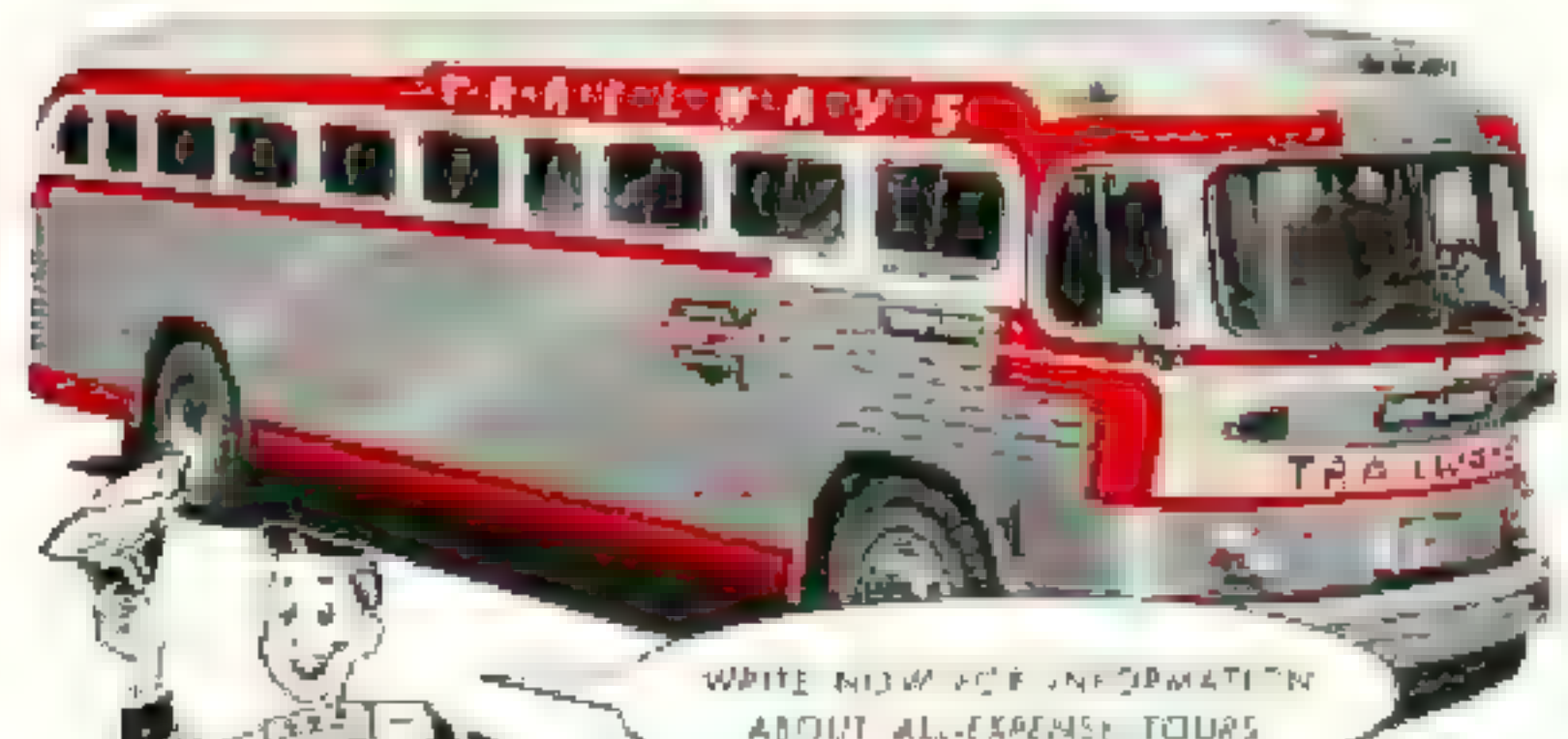
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1. *Journal of Management Studies*, 1995, 32, 101-114.

1. *Journal of the American Medical Association*, 1997; 277: 1025-1030.

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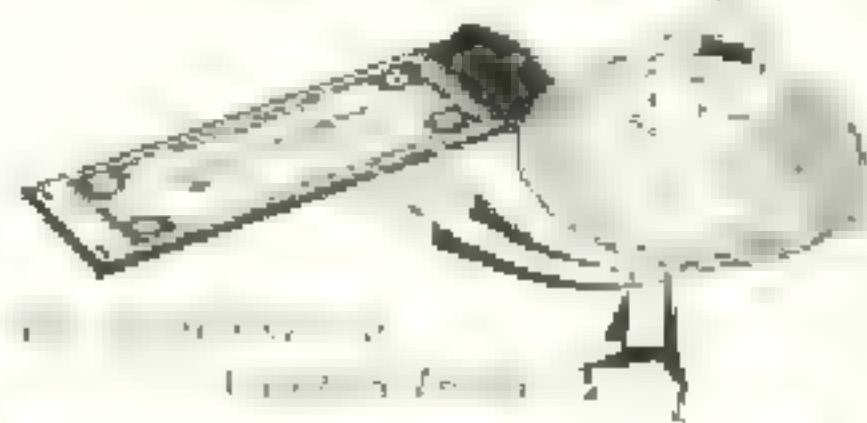
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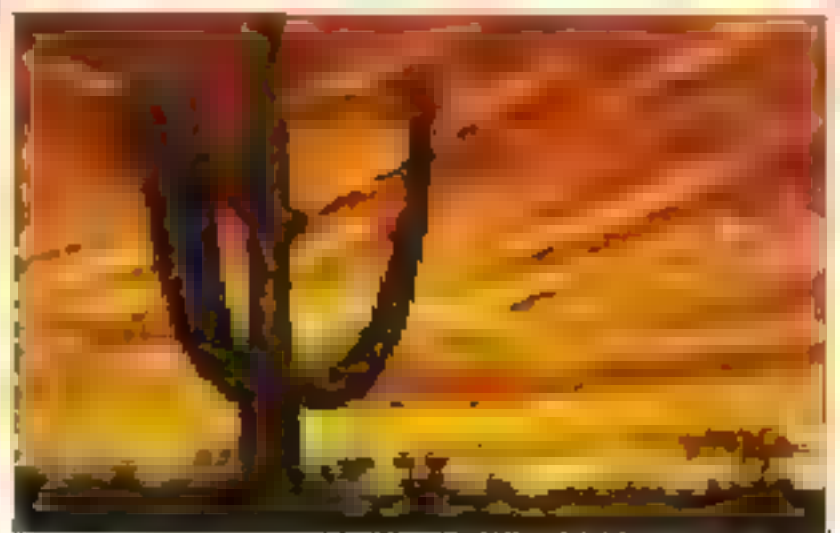
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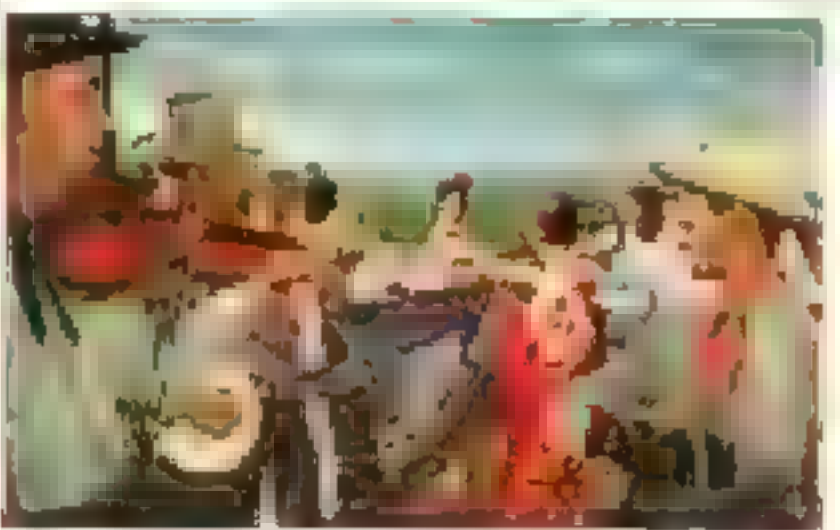
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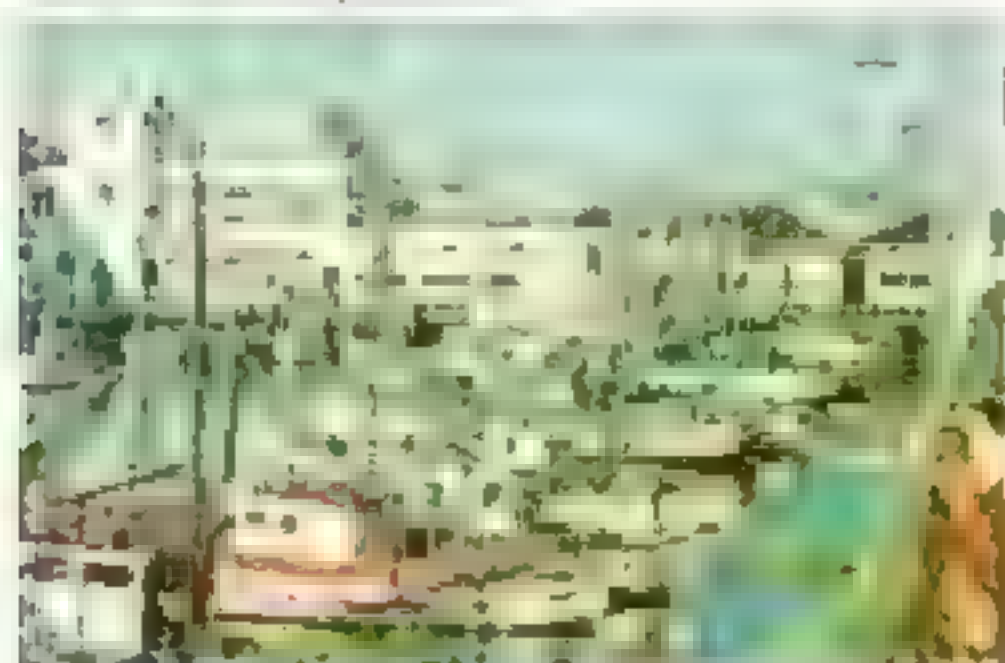
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1. *Journal of the American Medical Association*, 1997; 277: 1039-1043.

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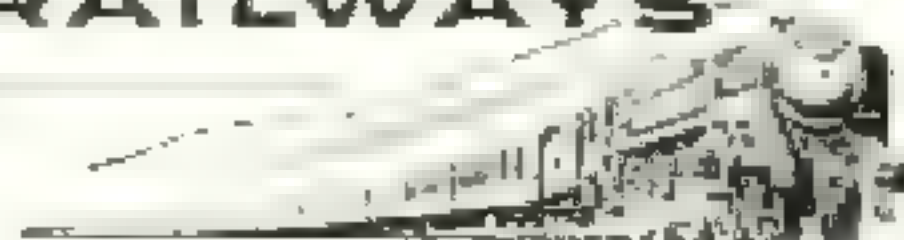
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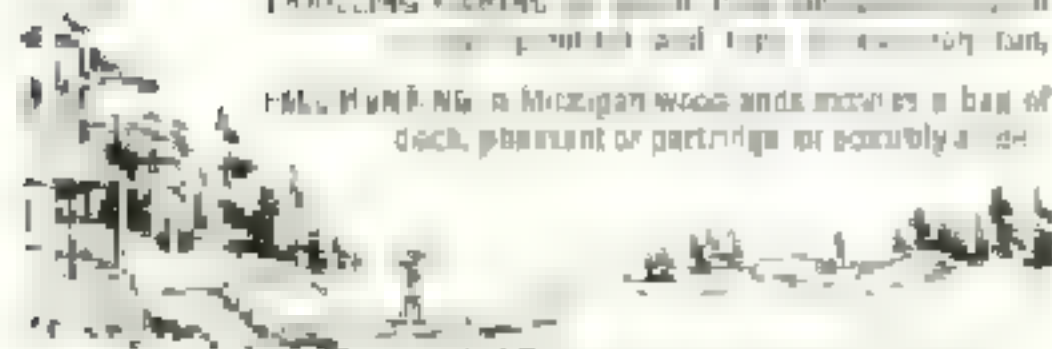
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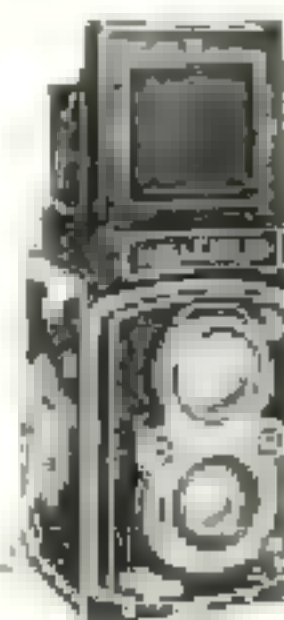
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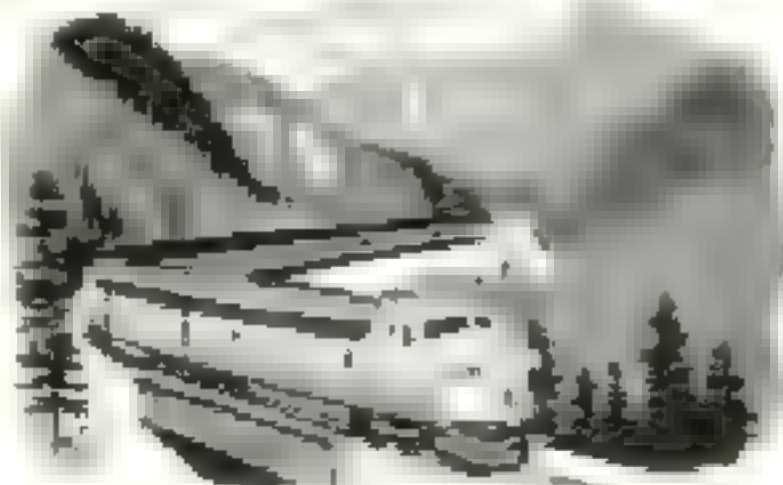
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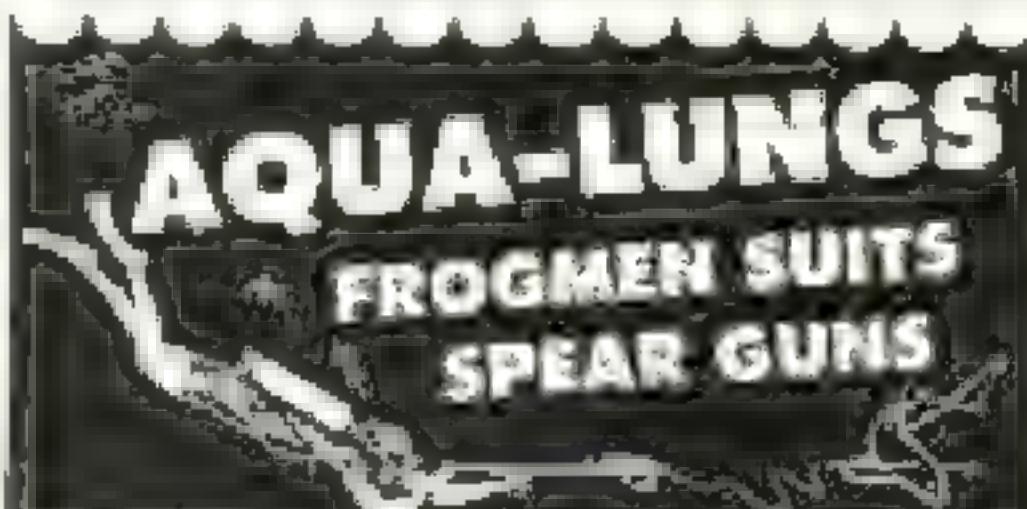
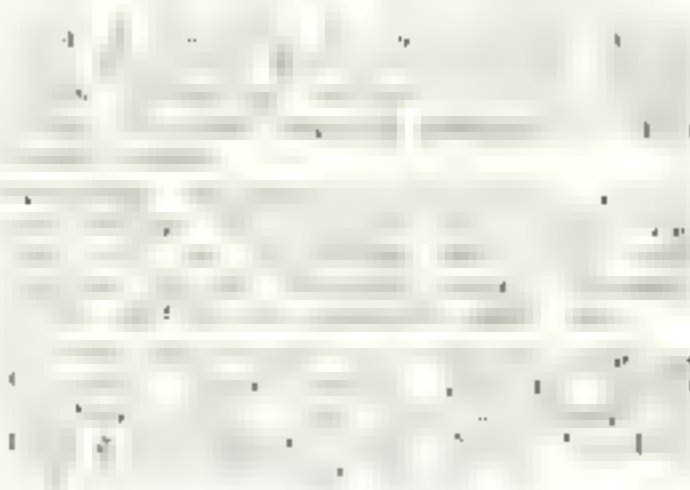
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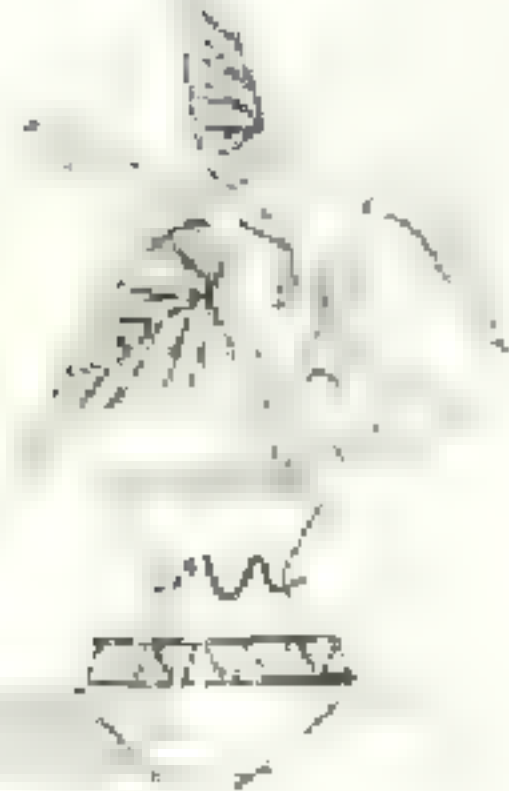
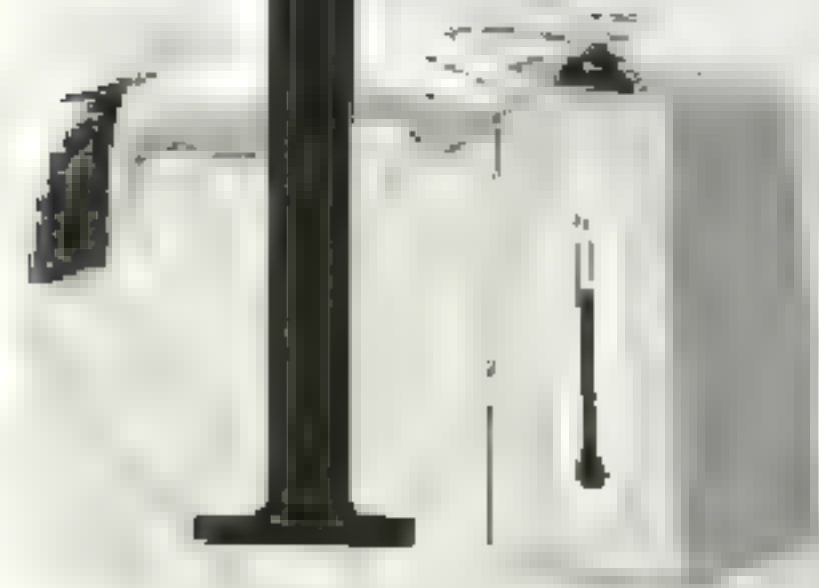
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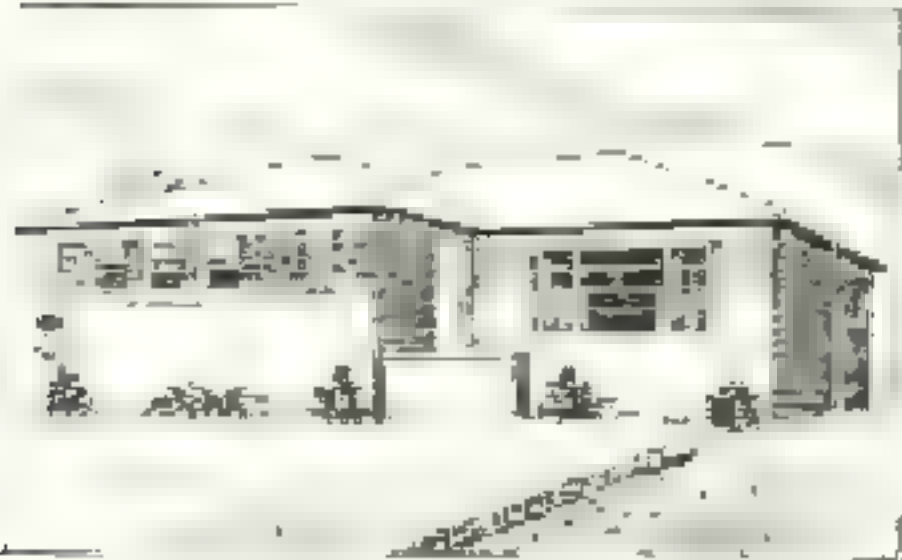


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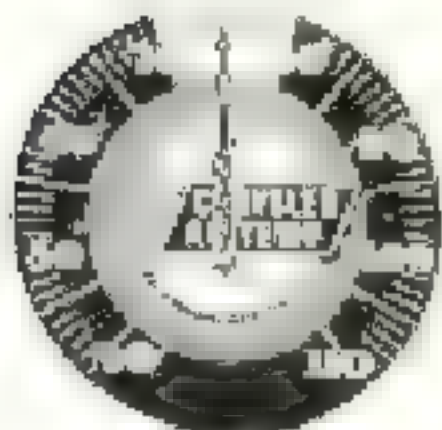
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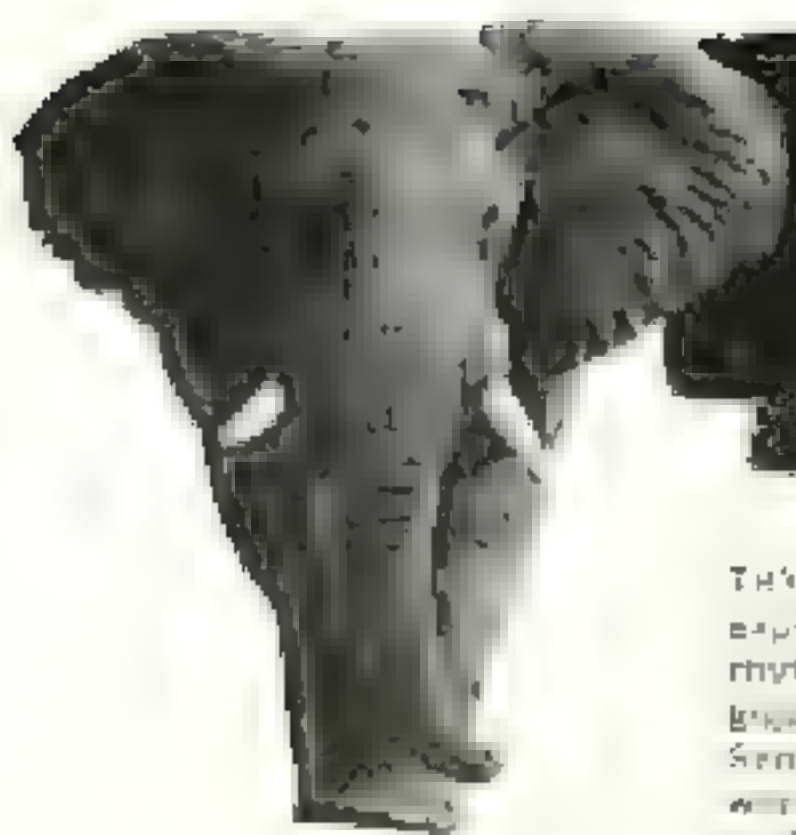


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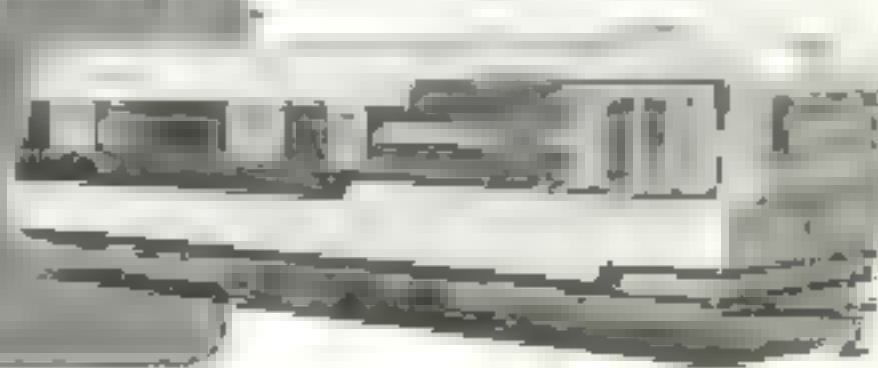
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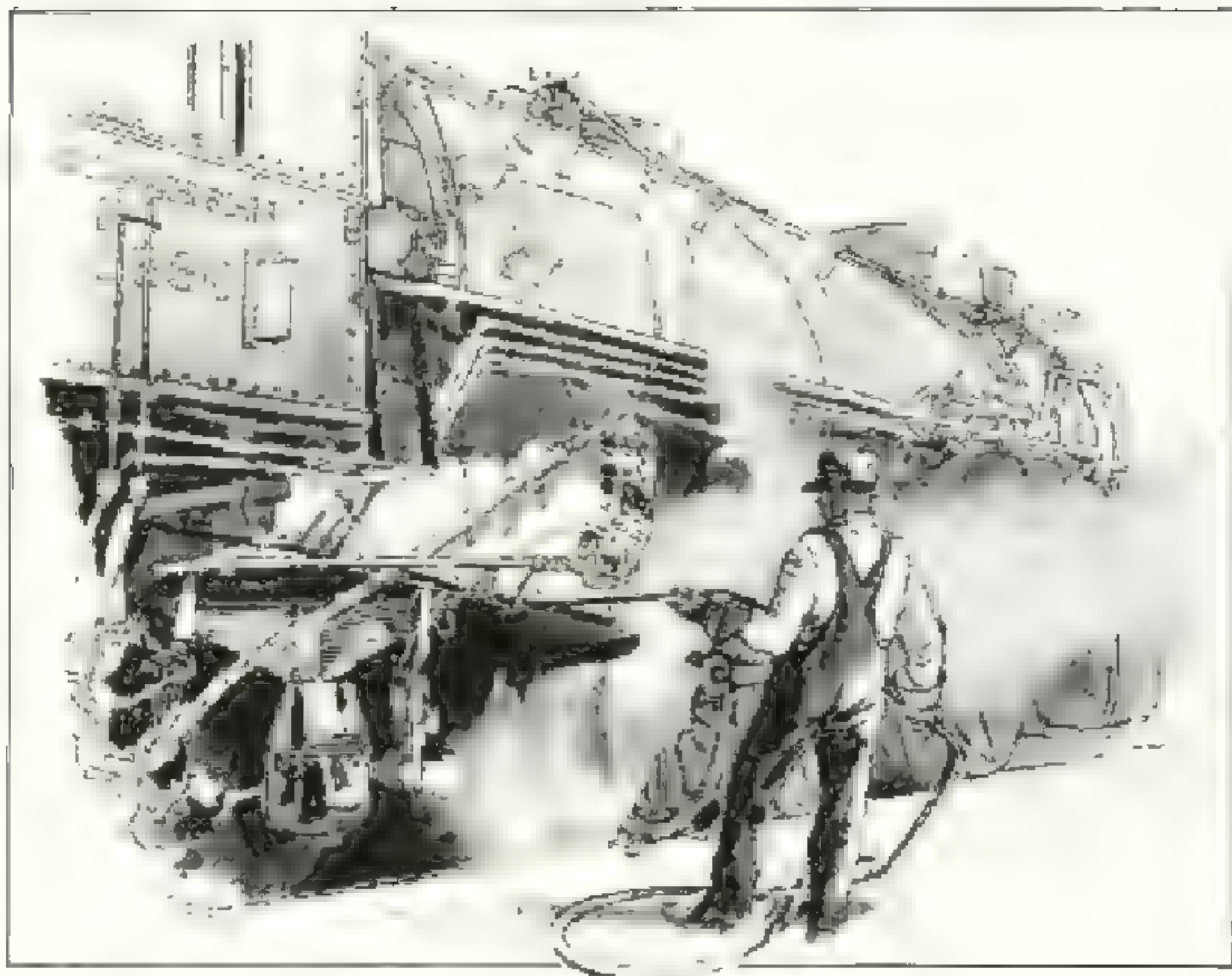


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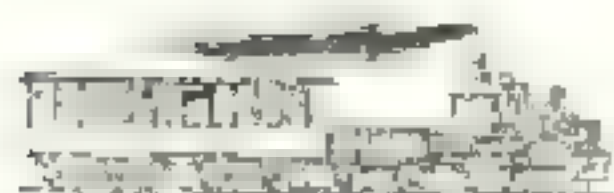
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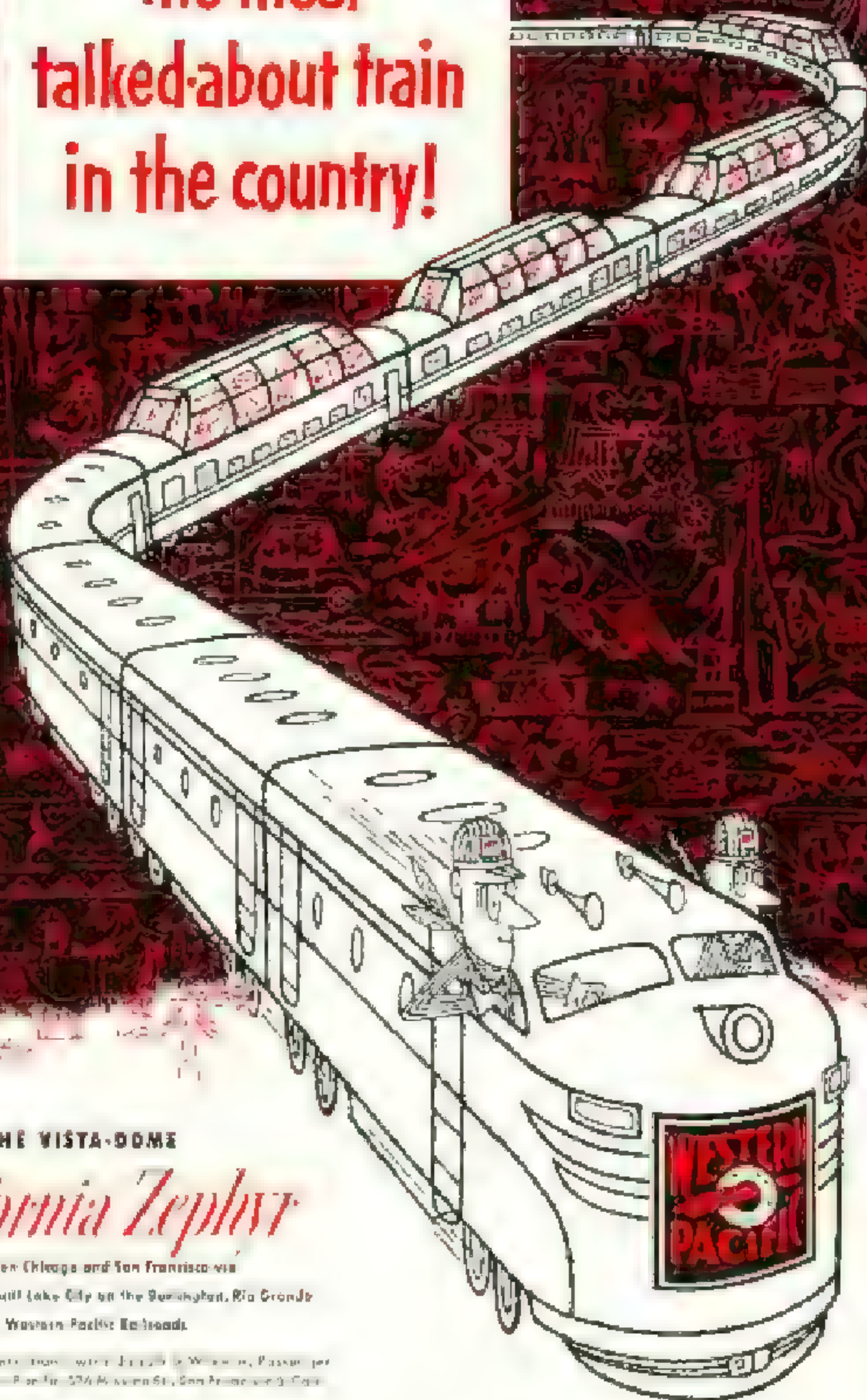
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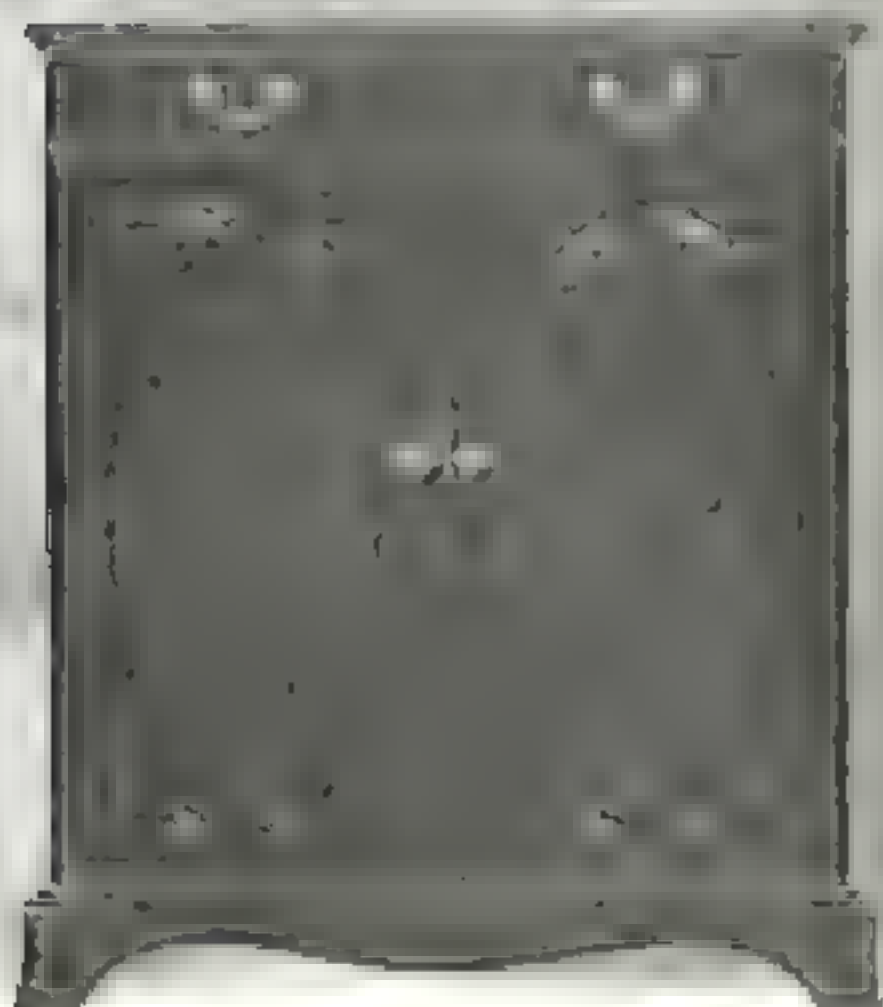
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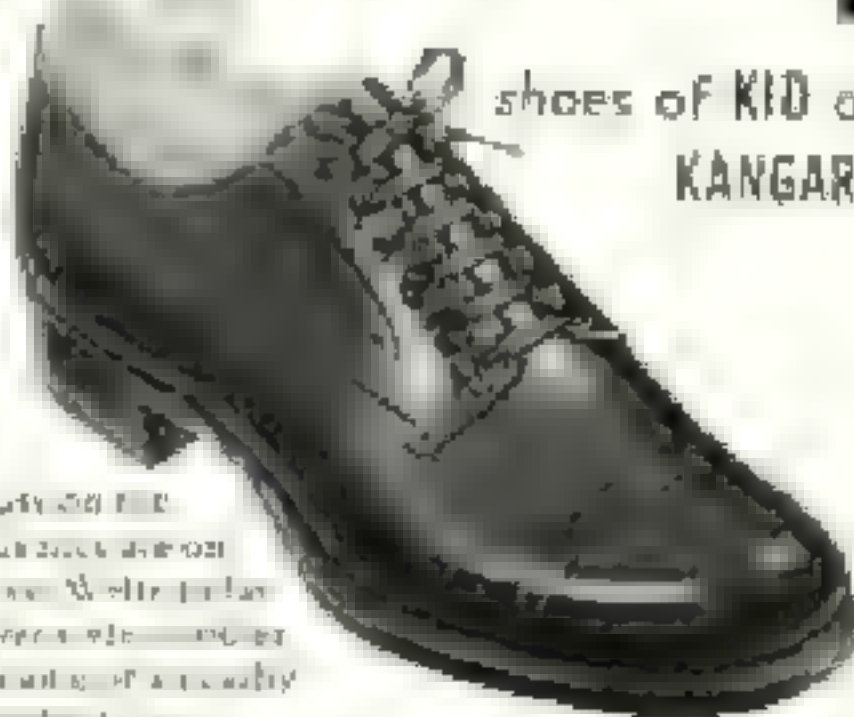
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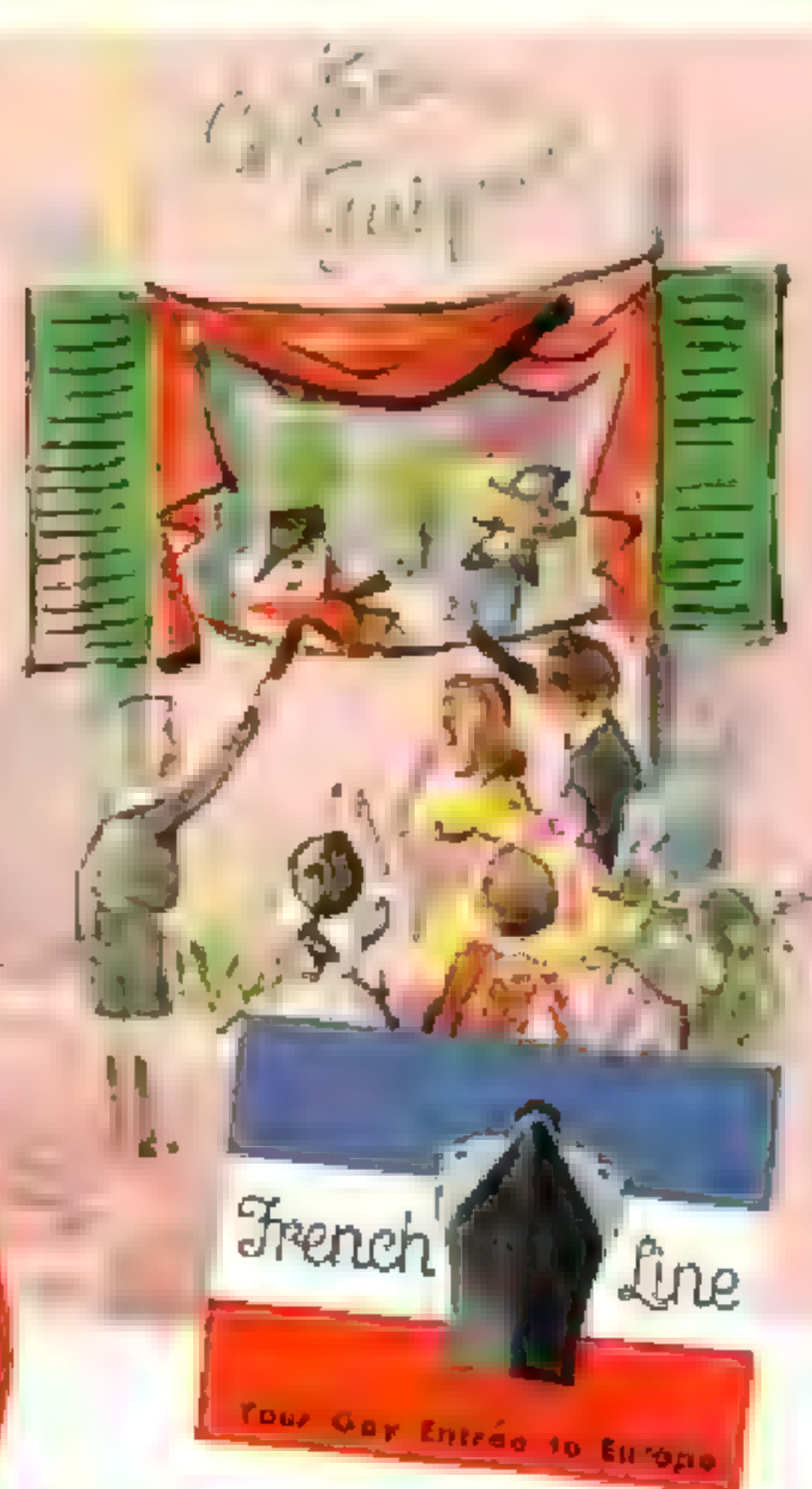
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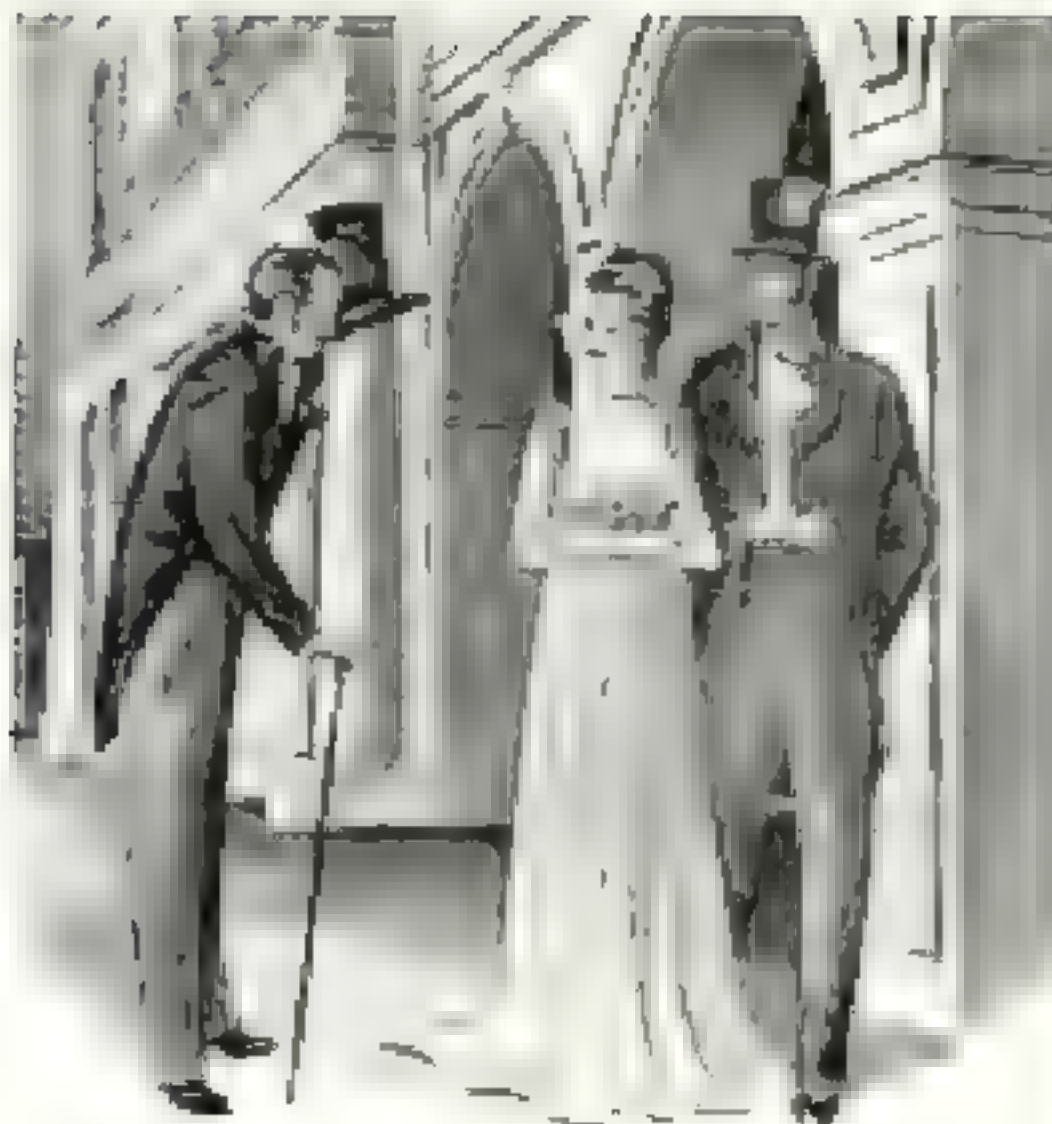
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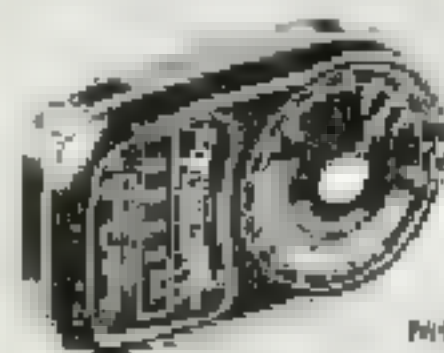
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What has TYRANNOSAURUS REX
got to do with

ARTHRITIS?



It may surprise you to know that doctors... in their search for more knowledge about arthritis... have made intensive studies of the bones and joints of prehistoric dinosaurs. They have found that dinosaurs, like *Tyrannosaurus Rex*, had arthritis joints.

As a result of these studies, medical science has learned much about the origin and history of arthritis, the joints that are most often affected by it, and how the disease damages the joints.

Arthritis has long been a leading cause of disability. Today about 10 million Americans have the disease in one of its many forms, the two most common of which are osteoarthritis and rheumatoid arthritis.

Of the two, osteoarthritis occurs most often. In fact, almost everyone who is beyond middle age has a touch of it, probably as a result of normal wear and tear on the joints.

Rheumatoid arthritis is the most severe form of the disease as it affects not only the joints, but the entire body. It usually begins between the ages of 20 and 50.

Not too long ago, arthritis often meant a life of misery or some degree of crippling.

Today, the outlook is far brighter for many arthritics. Under modern treatment, *carefully adjusted to the needs of the individual patient*, doctors can do much to relieve or prevent pain and to lessen or prevent disability.

Treatment, however, must be started early for best results. Otherwise, lasting damage may be done to one or more joints.

Arthritis seldom, if ever, strikes suddenly. Any person who complains of a generally "run down" condition, who has slight but recurring attacks of pain, discomfort or swelling in or about the joints, should be promptly examined by his doctor.

Early diagnosis is the key to successful treatment.

Authorities emphasize that chronic arthritis is rarely, if ever, controlled by any single measure. They also say that the so-called "cure cures" for arthritis generally do little more than provide temporary relief. Before using any medicine for arthritis, it is wise to have the doctor's advice.

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plenty of time
for a vacation
in Europe!

2000年1月1日，中国开始实施《中华人民共和国公司法》（以下简称《公司法》），这是中国第一部真正意义上的公司法。该法的实施，标志着中国公司法制的建立，对于规范公司行为，保护公司、股东、债权人及其他利益相关者的合法权益，维护社会经济秩序，促进社会主义市场经济的发展，具有十分重要的意义。

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23-Day JNA Soldier Tour in
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This tour is a unique opportunity
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from the perspective of the
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Campus custom calls for Coke

How naturally a pause for Coke
fits the pattern of busy people.
Take the case, for instance,
of a non-stop-packed schedule
of classes, sports and jobs.
She has only moments to relax
but that's time enough
for the quick refreshment of Coca-Cola.

"Movie cameras are really flying high these days"

"Most travelers carry snapshot cameras. But more and more are bringing movie cameras, too. It's the only way to catch all the color and action of your trip."

EVELYNN FICHETTE — a fine playwright whose plays cover her over some of the world's most spectacular scenery



If you're like most vacationers, you'll come back with plenty of pictures of holiday highlights. But you'll miss the color, the action, the excitement of the trip. You'll miss the things that make vacationing a fun experience.

Don't miss them! Carry a movie camera. You'll catch it all: the new faces, the new places, the new and thrilling experiences. And you

just won't be able to remember it in "still" pictures. You won't "stop" it.

So movies are wonderful! But aren't they hard to make?

Not a chance! Movies are as simple as snapshots. The only difference is you can't stop the camera. Some models don't even have to be focused. You can focus the others, if you like, or use an

adjustable focus that does it for you. That's why it's so easy.

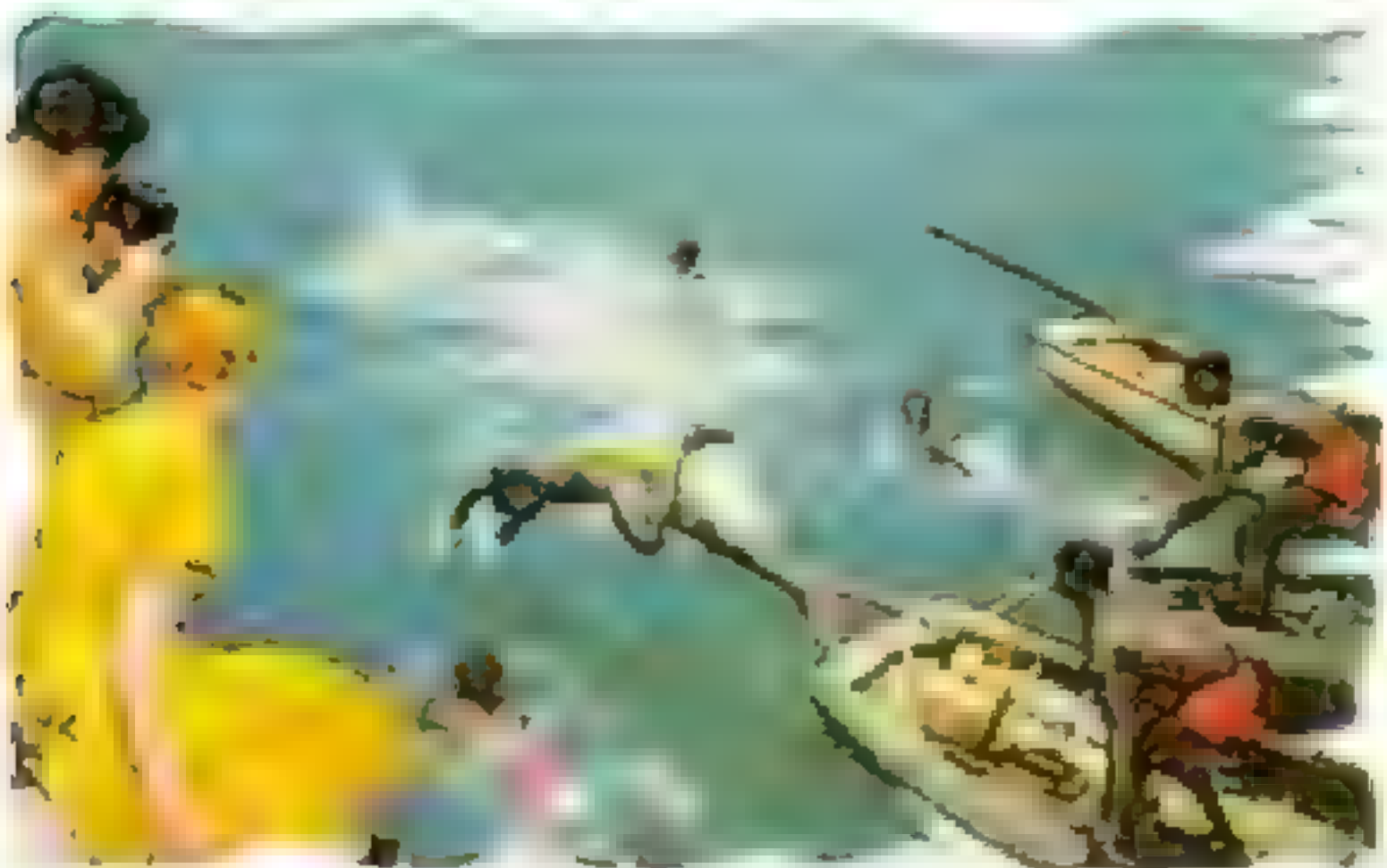
And that's why you need a movie camera. It has a built-in soundtrack, too, so you can follow with a sound picture of the scene.

It's easy then to make good movies. But the cost?

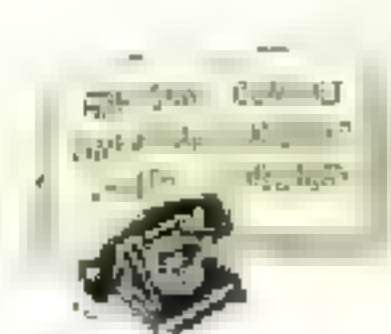
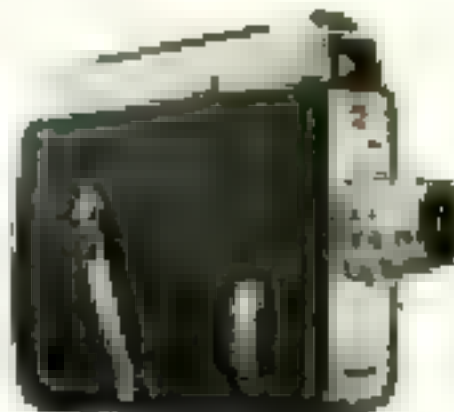
We — the Brownie Movie Camera — sell at only \$39.75. It uses regular 16mm film. It's so easy to use, you can make a movie in 10 minutes. And it's so small, it fits in your pocket. It's the only movie camera that costs less than a dinner at a restaurant.

Find out how you can afford to make movies. Write for the Brownie Movie Camera. It's the only movie camera that costs less than a dinner at a restaurant.

Write to: Eastman Kodak Company, Dept. 100, P.O. Box 100, New Haven, Conn. 06510. For more information, write to the Eastman Kodak Company.



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See Photographers, Artists and Supplies



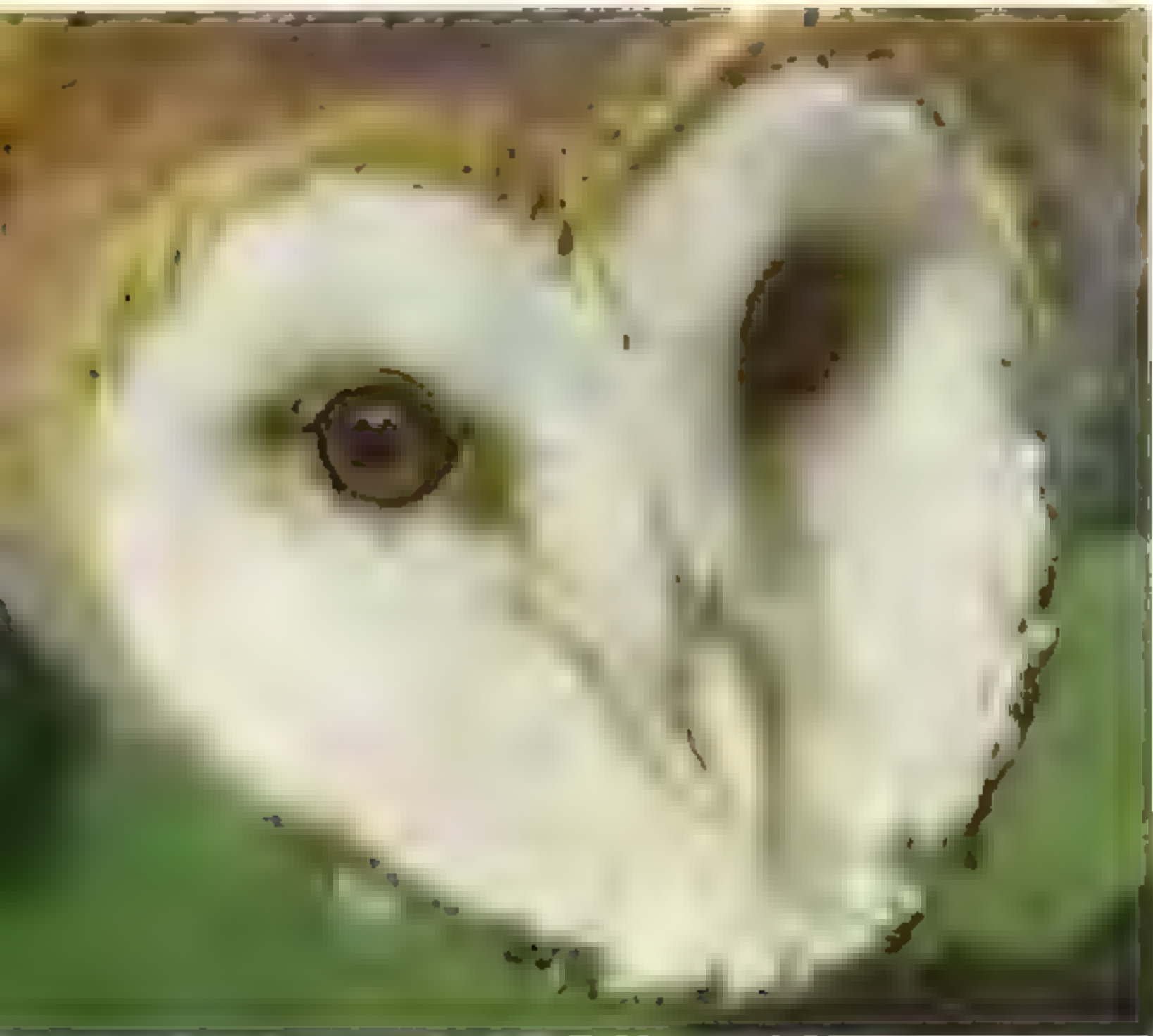
Eastman Kodak Company, Rochester 4, N.Y.

"LET'S MAKE MOVIES"
 This booklet tells you how to make movies. It's a free booklet. Write to Eastman Kodak Company, Dept. 100, P.O. Box 100, New Haven, Conn. 06510. For more information, write to the Eastman Kodak Company.

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NATIONAL GEOGRAPHIC Books in Natural Color



A Great Horned Owl, as it appears in the life-size color photograph in *Stalking Birds with Color Camera*.

A Brook Trout, as it appears in the life-size color photograph in *The Book of Fishes*.



Stalking Birds with Color Camera

MANY SECRETS of the bird world have been uncovered in this unique book. A series of 100 color photographs, taken with a color camera, shows birds in their natural, unguarded behavior.

In 100 pages of color, you can see birds in their natural, unguarded behavior. A series of 100 color photographs, taken with a color camera, shows birds in their natural, unguarded behavior. A series of 100 color photographs, taken with a color camera, shows birds in their natural, unguarded behavior.

The book is a masterpiece of photography. A series of 100 color photographs, taken with a color camera, shows birds in their natural, unguarded behavior. A series of 100 color photographs, taken with a color camera, shows birds in their natural, unguarded behavior.

A series of 100 color photographs, taken with a color camera, shows birds in their natural, unguarded behavior. A series of 100 color photographs, taken with a color camera, shows birds in their natural, unguarded behavior.

The Book of Fishes

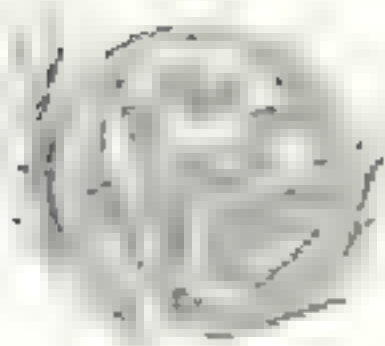
IF YOU HAVE NATURE in your mind, you will find this book a treasure trove. A series of 100 color photographs, taken with a color camera, shows fish in their natural, unguarded behavior.

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 seems to us the closest of all ties. And here, in the deep peacefulness that is our cemetery, our family monument conveys to us
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Your family monument is a quiet ex-pression of love and reverence for the very character
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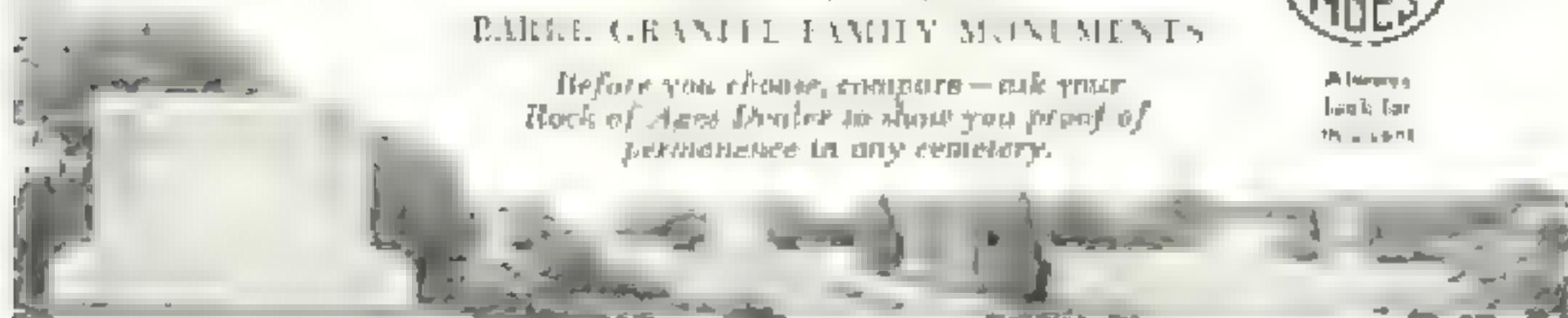
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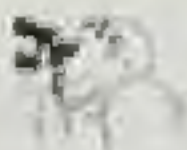
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1953

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10-53



One by one, the windows close their eyes

... for a wonderful Water Level Route sleep

Nighttime on New York Central. Long ago, the last, leisurely dining car patron pushed back his chair with a contented sigh. Only a few night owls still chat over refreshments in the club car. One by one, shades come down and lights go out as this great hotel-on-wheels glides along gentle, low-level valleys. The guests, in their Pullman private rooms, drift off to slumberland... with a downy comfort and a deep-down sense of all-weather security no skyway or highway can match.

GOING OUR WAY? Throughout this area, you'll find New York Central streamliners and dreamliners to make your trips a daylight delight or an overnight vacation.

New York Central

The Water Level Route—You Can Sleep



LINES TO A LINEMAN

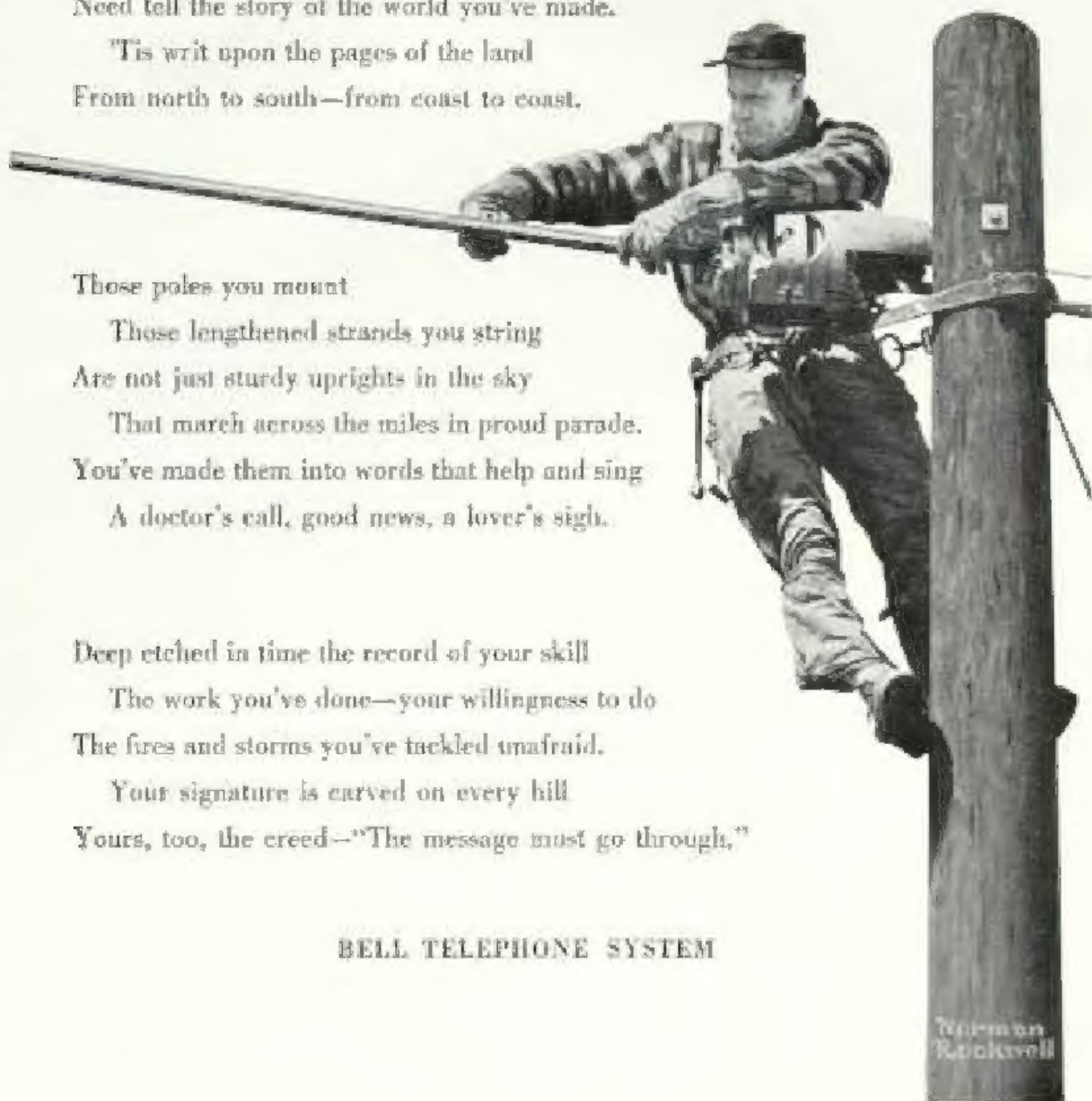
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No flowered phrase or oratory's boast
Need tell the story of the world you've made.
'Tis writ upon the pages of the land
From north to south—from coast to coast.

Those poles you mount
Those lengthened strands you string
Are not just sturdy uprights in the sky
That march across the miles in proud parade.
You've made them into words that help and sing
A doctor's call, good news, a lover's sigh.

Deep etched in time the record of your skill
The work you've done—your willingness to do
The fires and storms you've tackled unafraid.
Your signature is carved on every hill
Yours, too, the creed—"The message must go through."

BELL TELEPHONE SYSTEM



Norman
Rockwell



The New Haven's 40 RDCs Get Busy and Business

THE New Haven Railroad now operates 40 Budd rail diesel car RDCs. And the New Haven, RDC, and New Englanders are getting along very well together.

So well, for example, that when the railroad reinstated passenger service between Worcester and New London, after a lapse of twenty-eight years, it carried 82,000 passengers the first year, using one RDC Monday through Friday, and two RDCs Saturdays and Sundays.

Passenger traffic in and out of Boston's South Station has increased by thousands daily.

All over the non-electrified portions of the New Haven's system, scores of new schedules have been added to take full advantage of RDCs ability to provide frequent as well as pleasant service. These include many middle-of-the-day "shoppers" runs, which are proving very popular.

New Englanders take pride in being a little different. But their response to RDC is typical of people everywhere, from Australia to Cuba, from New York to California. The Budd Company, Philadelphia, Detroit, Gary,



PIONEERS IN BETTER TRANSPORTATION